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Richard Prime.

L E T T E R S
 ON THE
 E L E M E N T S
 OF
 B O T A N Y.

ADDRESSED TO A LADY.

By the celebrated J. J. ROUSSEAU.

TRANSLATED INTO ENGLISH,
 WITH NOTES,
 AND TWENTY-FOUR ADDITIONAL LETTERS,
 FULLY EXPLAINING THE SYSTEM OF LINNÆUS.

By THOMAS MARTYN, B.D. F.R.S.

PROFESSOR OF BOTANY
 IN THE UNIVERSITY OF CAMBRIDGE.

THE SECOND EDITION,
 WITH CORRECTIONS AND IMPROVEMENTS.

L O N D O N:
 PRINTED FOR B. WHITE AND SON,
 AT HORACE'S HEAD, FLEET-STREET.

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LETTERS

ON THE

ELEMENTS

OF

ASTROLOGY

ADDRESSED TO A LADY

BY AN ASTRONOMER OF THE 17TH CENTURY

TRANSLATED INTO ENGLISH

WITH NOTES

AND TWENTY-FOUR ADDITIONAL LETTERS

RELATIVE TO THE HISTORY OF ASTRONOMY

BY THOMAS MARTYN, D.D.

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LONDON

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TO
THE LADIES
OF
GREAT BRITAIN:
NO LESS EMINENT
FOR THEIR ELEGANT AND USEFUL
ACCOMPLISHMENTS,
THAN ADMIRER
FOR THE BEAUTY OF THEIR PERSONS:

THIS SECOND EDITION OF THE FOLLOWING
LETTERS

IS, WITH ALL HUMILITY,

INSCRIBED

BY

THE TRANSLATOR AND EDITOR.

THE
TRANSLATOR'S PREFACE.

WHEN the Elementary Letters on Botany^a first presented themselves to me, in turning over the last complete edition of Rousseau's works^b, their elegance and simplicity pleased me enough, to make me give them a second more attentive perusal. I then thought that they had considerable merit; and that if they were disembarrassed from the chaos of fifteen quarto volumes, and translated into English, they might be of use to such of my fair countrywomen and unlearned countrymen as wished to amuse themselves with natural history.

^a Lettres Elementaires sur la Botanique a Madame de L***. Melanges, tome ii. page 531, &c.

^b Collection complete des Oeuvres de J. J. Rousseau. Geneve, 1782.

When the translation was done, I perceived that the foundation only being laid by the ingenious author, it could be of little service, without raising the superstructure. This I have attempted; not flattering myself that it is executed at all in Rousseau's manner, which is inimitable, but merely with the design of being useful.

What books can you recommend, that may enable me to acquire a competent knowledge of Botany? is a question that has very frequently been asked me. To the learned I can readily answer, the works of Linnæus alone will furnish you with all the knowledge you have occasion for; or, if they are deficient in any point, will refer you to other authors, where you may have every satisfaction that books can give you^c. But I am not very solicitous to relieve these learned gentlemen from

^c These writings of Linnæus are — *Philosophia Botanica*, that inexhaustible mine of elementary knowledge — *Genera Plantarum* — *Species Plantarum* — and *Systema Vegetabilium*, which is an epitome of the two last.

their embarrassment; they have resources enough, and know how to help themselves. As to the unlearned, if I were to send them to the translation of Linnæus's works, they would only find themselves bewildered in an inextricable labyrinth of unintelligible terms, and would only reap disgust from a study that is, perhaps, more capable of affording pleasure than any other. If I were to bid them sit down, and study their grammar^d regularly; so dry and forbidding an outset might discourage the greater number; and few would enter the temple through a vestibule of so unpromising an appearance. A language however must be acquired; but then it may be done gradually; and the *tædium* of it may, in some measure, be relieved by carrying on at the same time a study of facts, and the philosophy of nature. This seems to have been Rousseau's idea, and I have endeavoured

^d In Lee's Introduction, Rose's Elements, &c.

not to lose sight of it, in my continuation of his eight ingenious letters.

Let an unlearned person then who is desirous of acquiring some knowledge of Botany, begin by taking a few plants with flowers, whose parts are sufficiently visible, and examine them patiently by the descriptions and characters which are given in the following pages. You may perhaps know some plants by their names; or if not, you will be unfortunate indeed if you have not a friend who will show you the flower of a lily. If in the course of your examination, any term should occur, that is not explained in the page, or mentioned in the index, you may have recourse to the Dictionary, the Introduction, or the Elements. If you can have patience to go through the first seven letters, with a plant or two of each natural tribe explained in them; to make yourself master of the classification in the ninth and
tenth;

tenth; and to examine the obvious plants, whose characters are given in the twenty following letters, as they occur; I flatter myself that you will find little difficulty after that, in determining any plant which you shall happen to meet with, by Linnæus's characters, as delivered by his translators^e: whereas if you had begun with them, I am confident you would have been discouraged from proceeding.

Good plates, or figures of plants, will also be of considerable assistance: those of Mr. Curtis's *Flora Londinensis* will suffice for most of the British natives: especially as he has accompanied his plates with ample and accurate descriptions in English as well as Latin. Mr. Miller's figures to his Gardener's Dictionary, exhibit a great number of the most re-

• A system of vegetables, &c. translated from the 13th edition of Linnæus's *Systema Vegetabilium*, by a botanical society at Lichfield. — The genera *Plantarum* is now also translated by the same hands.

markable

markable foreigners. There is indeed no want of such help^f: but the misfortune is, that these books are so very expensive, as to be far beyond the purse of all but the opulent.

I beg leave to protest against these letters being read in the easy chair at home; they can be of no use but to such as have a plant in their hand; nor do they pretend to any thing more, than to initiate such as, from their ignorance of the learned languages, are unable to profit by the works of the learned, in the first principles of vegetable nature. Botany is not to be learned in the closet; you

^f Catesby's *Carolina*. Martyn's *Historia Plantarum Rariorum*. Oeder's *Flora Danica*. Dillenius's *Hortus Elthamensis*. Besler's *Hortus Eystettenfis*. Rheede's *Hortus Malabaricus*. Rumphius's *Herbarium Amboinense*. Trew's *Florum Imagines & Plantæ rariores*. Jacquin's *Flora Austriaca* and *hortus Vindobonensis*. Ehret's *Plantæ rariores*. Blackwell's *Herbal*. Hill's *Vegetable System*. Merian's *Surinam* and *European Plants and Insects*. Allionii *Flora Pedemontana*. Pallas's *Flora Rossica*; and Scopoli's *Flora Insubrica*—are all very fine works, but cost an immense sum to purchase them.

must

must go forth into the garden or the fields, and there become familiar with Nature herself; with that beauty, order, regularity, and inexhaustible variety which is to be found in the structure of vegetables; and that wonderful fitness to its end, which we perceive in every work of creation, as far as our limited understandings, and partial observations, give us a just view of it.

In this second edition a few mistakes are corrected, and some improvements are made; the principal of these is, a reference at the foot of the page to some authors who have figured the plants. For this purpose I have preferred Curtis and Miller: when these failed me, I have had recourse to the *Flora Danica*, &c. and I have usually referred to old Gerard, or Morison, or both, for the sake of such as do not possess the more splendid works, and live remote from public libraries.

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INTRODUCTION.

THE principal misfortune of Botany is, that from its very birth it has been looked upon merely as a part of medicine. This was the reason why every body was employed in finding or supposing virtues in plants, whilst the knowledge of plants themselves was totally neglected: for how could the same man make such long and repeated excursions as so extensive a study demands; and at the same time apply himself to the sedentary labours both of the laboratory, and attendance upon the sick; which are the only methods of ascertaining the nature of vegetable substances, and their effects upon the human body? This false idea of Botany, for a long time, almost confined the study of it to medicinal plants, and reduced the vegetable chain to a small number of interrupted links. Even these were very ill studied, because the substance only was attended to, and not the organization. How indeed could they be much interested in the organical structure of a substance of which they had no other idea but as a thing to be pounded in a mor-

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tar? Plants were searched for, only to find remedies; it was simples, not vegetables, that were looked after. This was very right, it will be said; may be so. Hence nevertheless it follows, that, if men were ever so well acquainted with remedies, they were very ignorant of plants; and this is all that I have here advanced.

Botany was nothing; there was no such study; and they who plumed themselves most upon their knowledge of vegetables had no idea of their structure, or of the vegetable œconomy. Every body knew by sight five or six plants in his neighbourhood, to which he gave names at random; enriched with wonderful virtues, which he took it in his head they possessed; and each of these plants, changed into an universal panacea, was alone sufficient to render all mankind immortal. These plants, transformed into balsams and ointments, quickly disappeared; and soon made room for others, to which new comers, in order to distinguish themselves, attributed the same effects. Sometimes it was a new plant, decorated with ancient virtues: sometimes old plants, under new names, sufficed to enrich new quacks. These plants had a different vulgar name in every province, and they who pointed them out for their drugs, at most gave them only those names by which they were known on the spot where they lived: thus, when their recipes travelled into other countries, it was
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no longer known what plant they spoke of; every body substituted another after his own fancy, without regarding any thing else, but giving it the same name. Such is the whole art that the Myrepsuses, the Hildegardises, the Suardi, the Villanovæ, and the rest of the doctors of that time, employed in the study of those plants which they treat of; and it would be difficult perhaps for any body to know one of them by the names or descriptions which they have given them^a.

At the revival of learning, every thing disappeared to make room for the works of antiquity; nothing was then either good or true but what was to be found in Aristotle or Galen. Instead of searching for plants where they grew, men studied them only in Pliny and Dioscorides; and there is nothing so frequent in the authors of those times, as to find them denying the existence of a plant, for no other reason but because Dioscorides has not mentioned it. These learned plants however must be found in nature, in order to

^a Myrepsus's book is entitled *Antidotarium parvum*. Hildegardis was a lady and an abbess; she flourished about 1180, and wrote, among others, a treatise entitled *Physica Leguminum, Fructuum, Herbarum, &c.* Suardus's book is entitled *Antidotarium*, and was printed at Venice 1551 fol. — Arnoldus de Villanova put together *Regimen Sanitatis Salerni*, printed in 1482, 1484, 1490, 1491, 1493, 1505, 1509, &c. and was author of many other medical and medico-botanical works. He is said to have died in 1313.

make use of them according to the precepts of their master. They bestirred themselves therefore, they set themselves to search, to observe, to conjecture; and made every effort to find, in the plant which they chose, the characters described in their author; and since translators, commentators, and practitioners, seldom agreed in their choice, twenty names were given to the same plant; and the same name to twenty plants; every man maintaining that his own was the true one, and that all the rest, not being that of Dioscorides, ought to be proscribed. From this conflict indeed it followed at length that more careful researches were made, and some good observations, which deserved not to be forgotten; but at the same time such a chaos of *nomenclature*, that the Physicians and Herborists no longer understood each other: there was no possibility of communicating their mutual lights; nothing remained but disputes of words and names; and even every useful inquiry and description was lost, for want of being able to decide what plant each author had spoken of.

Real botanists however began to be formed: such as Clusius, Cordus, Cæsalpinus, Gesner^b; good and instructive books on this subject

^b If we follow the order of birth, the arrangement should have been Cordus 1515, Gesner 1516, Cæsalpinus 1519, Clusius 1526: if we range them from the dates of

subject began to be published, in which already appeared some traces of method^c. And it has certainly been a loss that these pieces have become useless and unintelligible by the mere discordance of names^d. But these authors, beginning to unite species and separate genera, according to their own manner of observing the habit and apparent structure, occasioned new inconveniences, and a fresh obscurity; because each author, regulating his nomenclature by his own method, created new genera, or separated old ones, as the characters of his own required. So that genera and species were so jumbled together,

of their publications, they should stand thus—Cordus 1535, Gesner 1540, Clusius 1557, Cæsalpinus 1583.

^c Indeed! some traces of method only in the celebrated work of Cæsalpinus! He who first invented a complete arrangement of plants, and stands unrivalled as the father of method! He to whom every succeeding system-monger owes so many obligations! Though among them all Ray alone confesses it. What Rousseau affirms is true only of the excellent, the illustrious Gesner; the other two thought nothing of arrangement: No, nor the Bauhins, nor any other, till Morison and Ray.

^d If Rousseau means to speak here concerning the works of the forementioned authors, this is not true. The treatises of Gesner and Clusius are every where referred to, even by Linnæus, and consequently their nomenclature is well known. The principal work of Valerius Cordus is Gesner's History of Plants, which he published in 1561. Cæsalpinus's book is now become rather a matter of respectable curiosity than use.

as to leave scarcely any plant without as many names as authors that described it ; which made the study of the nomenclature as tedious, and often more difficult, than that of the plants themselves.

At length the two illustrious brothers appeared ; who alone have done more for the advancement of Botany than all the rest together who preceded, and even followed, them, till Tournefort. Rare geniuses ! whose vast knowledge and solid labours, consecrated to Botany, render them worthy of that immortality which they have acquired. For, till this part of natural history falls into oblivion, the names of John and Caspar Bauhin will live along with it in the memory of mankind^e.

Each of these men undertook an universal history of plants : but what more immediately relates to our present purpose is, that they each of them undertook to join to it a *Synonymy*, or exact list of the names that every plant bore in all the writers which preceded them. This labour was become absolutely necessary to enable us to reap any advantage of their observations ; for without that it was almost impossible to follow and distinguish every plant among so many names.

^e John the elder was born at Lyon, in 1541, and died in 1613. Caspar was not born till 1560, and died in 1624.

The eldest in a manner executed this undertaking in three volumes in folio, printed after his death; and he has given such just descriptions of the plants, that we are rarely deceived in his synonyms^f.

The brother's plan was yet more extensive, as appears by the first volume which he published, and from which we may judge of the immensity of the whole work, if he had found time to execute it^g; but, excepting this volume, we have no more than the titles of the rest in his pinax^h; and this pinax, the produce of forty years labour, is still the guide to all those who study this subject, and wish to consult ancient authorsⁱ.

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^f Chabræus was the editor, and Francis Louis de Graffenried, of Bern, was at the expense of the publication. This work derives no excellence from the paper or print. The plates are small and poorly executed; they belonged to Fuchsius, and were purchased by the bookseller for this purpose; the editor has not unfrequently put them in wrong places. John Bauhin's History however has great intrinsic excellence, for the number of plants well described, and a judicious compilation of whatever had been done before his time. It is entitled "*Historia Plantarum Universalis Auctore Johanne Bauhino Archiatro, &c. Ebrod. 1651.*"

^g *Theatri Botanici, pars I. Basil. 1658 and 1663, fol.*

^h *Pinax Theatrici Botanici seu index in Theophrasti, Dioscoridis, Plinii & botanicorum, qui a seculo scripserant, opera, plantarum, fere 6000 nomina cum synonymiis & differentiis. Opus XL annorum Basil. 1623 & 1671. 4to.*

ⁱ The judicious, the indefatigable Haller, from whose

The nomenclature of the Bauhins being formed only from the titles of their chapters, and these titles usually comprising several words, hence came the custom of giving, as the names of plants, nothing but long ambiguous phrases, which made this nomenclature not only tedious and embarrassing, but pedantic and ridiculous. I own there might have been some advantage in this, provided their phrases had been better constructed; but being composed indifferently of the names of places whence the plants came, of persons who sent them, and even of other plants to which they fancied them to bear some similitude; these phrases were sources of new embarrassment and fresh doubts, because the knowledge of one plant required that of several others to which the phrase

whose judgment there lies no appeal, says of Caspar Bauhin, that he emulated his elder brother in Botany, that he was laborious in collecting, and knew a greater number of plants, being more enriched with them by his scholars and friends, but that his judgment was less acute; that he admitted too many varieties for species; that he has repeated the same plant under different names; that he was less accurate than his brother in his descriptions, less acquainted with the natural classes, and unfortunate, as well as himself, in being obliged to divide his time between Anatomy and Botany. *Bibl. Botan. I. p. 384.*

Haller says also of this *par nobile fratrum* that for their unwearied diligence they well deserved to lead the way in a new age of Botany; and accordingly he puts them at the head of the *Collectores* in his sixth book,

referred,

referred, and whose names were not better determined than its own.

In the mean time distant voyages were incessantly enriching Botany with new treasures; and, whilst the old names already overloaded the memory, it was necessary to invent new ones incessantly for the new plants that were discovered. Lost in this immense labyrinth, the botanists were obliged to seek a thread to extricate themselves from it; they attached themselves therefore at last seriously to method; Herman, Rivinus, Ray^k, severally proposed their own; but the immortal Tournefort carried away the prize from them all^l; he first ranged the whole vegetable kingdom systematically^m; and, reforming

* The order should have been Ray, Herman, Rivinus. Ray published his first work in 1660, and his method in 1682*. Herman began to write in 1687, and printed his method in 1690. Rivinus published the first part of his method in 1690. Morison had before published his in 1669, and comes next after Cæsalpinus. A great chasm between 1583 and 1669; and the scholar far inferior to the master.

^l Tournefort first published his system in 1697: it was specious, and generally fashionable, till Linnæus's superseded it.

^m How far this is true may be seen in note^k. Tournefort's however may be said to have been the first complete regular arrangement; though how it could ever be used to good purpose, without any characters or descriptions of the species, I do not understand.

* Ray however drew up tables for Bishop Wilkins in 1667.

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the nomenclature in part, combined it by his new genera with that of Caspar Bauhin: but, far from freeing it of its long phrases, he either added new ones, or loaded the old ones with additions, which his method obliged him to make. The barbarous custom was then introduced of tagging new names to the old ones by a contradictory *qui quæ quod*, making of the same plant two distinct genera.

For instance — ‘ Dens Leonis *qui* Pilosella
‘ folio minus villoso. Doria *quæ* Jacobœa
‘ orientalis limonii folio. Titanokeratophy-
‘ ton *quod* Lithophyton marinum albicans ?’

Thus was the nomenclature loaded. The names of the plants became not only phrases but periods. I shall cite one of Plukenet’s, to prove that I do not exaggerate. “ Gramen
“ myloicophorum carolinianum seu gramen
“ altissimum, panícula maxima speciosa, e
“ spicis majoribus compressiusculis utrinque
“ pinnatis blattam molendariam quodam
“ modo referentibus, composita, foliis con-
“ volutis mucronatis pungentibus.” *Almag.*
137ⁿ.

It would have been all over with Botany, if this practice had continued; the nomenclature being now absolutely insupportable, could no longer subsist in this state; and it was become necessary either that a reformation should be made, or that the richest, the most lovely, and

* See Linnæus’s *Critica*, and *Philosophia Botanica*.

the easiest of the three parts of Natural History should be abandoned.

At length Linnæus, full of his system, and the vast ideas which it suggested to him, formed the project of new-moulding the whole; a task which every body felt the necessity of, but no one dared to undertake. He did more, he executed it; and, having prepared in his *Critica Botanica* the rules by which it ought to be conducted, he determined the genera of plants in his *Genera Plantarum*, and afterwards the species in his *Species Plantarum*°; in such a manner, that, by keeping all the old names that agreed with these new rules, and new casting all the rest, he established at length a clear nomenclature, founded upon the true principles of the art which he had set forth. He preserved all the ancient genera which were truly natural; he corrected, simplified, united, or divided, the rest as their true characters required. And in forming his names he followed, sometimes even somewhat too severely, the rules which he had laid down.

With respect to the species, descriptions and distinctions were necessary to determine them; phrases therefore remained always indispensa-

° The first sketch of Linnæus's system was published in 1735; the last edition of *Systema Vegetabilium* in 1784: the *Critica Botanica* in 1737: the first edition of the *Genera* the same year, and the last in 1764: the first edition of the species in 1753, the second in 1762 and 1763. See Dr. Pulteney's excellent account of the writings of Linnæus.

ble; but, by confining himself to a small number of technical words, well chosen and well adapted, he made good short definitions deduced from the true character of the plant, banishing rigorously all that was foreign to it. For this it was necessary to create a new language for Botany, that would spare the long periphrases of the old descriptions. Complaint has been made that the words of this language are not all to be found in Cicero. This complaint would be reasonable, had Cicero written a complete treatise of Botany. Those words however are all either Greek or Latin, expressive, short, sonorous, and even form elegant constructions by their extreme precision. It is in the constant practice of the art that we feel all the advantage of this new language, which is as convenient and necessary for Botanists as that of algebra is to mathematicians.

Hitherto Linnæus had indeed determined the greatest part of known plants, but he had not named them; for defining a thing is not naming it, a phrase can never be a true name, nor can it come into common use. He provided against this defect by the invention of trivial names^p, which he joined to the generical ones in order to distinguish the species. By this contrivance the name of every plant is composed only of two words, which alone,

^p These specific or trivial names appear first in the *Pan Suecicus* of 1749; but they were brought to perfection in the first edition of the *Species Plantarum*, published four years after.

when

when chosen with discernment, and applied with propriety, often make the plant better known than the long phrases of Micheli and Plukenet. To be still better and more regularly acquainted with it, there is the phrase, which doubtless must be known, but need not be repeated every time we have occasion to speak of the object.

Nothing is more pedantic or ridiculous, when a woman, or one of those men who resemble women, are asking you the name of an herb or a flower in a garden, than to be under the necessity of answering by a long file of Latin words that have the appearance of a magical incantation; an inconvenience sufficient to deter such frivolous persons from a charming study offered with so pedantic an apparatus.

However necessary or advantageous this reform might be, nothing less was wanting than Linnæus's profound knowledge to execute it with success, and the reputation of this great naturalist to make it be universally adopted. It met with resistance at first, and meets with it still. This could not be otherwise; his rivals in the same career look upon this adoption as a confession of inferiority which they do not like to make; his nomenclature seemed so much of a piece with his system, that they could not well be separated. And botanists of the higher order, who think themselves obliged through pride not to adopt the system of any other, but each man to have his own, will not sacrifice their pretensions to the progress of an
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art for which the professors have rarely a disinterested fondness.

National jealousies also oppose the admission of a foreign system. People think themselves obliged to support the famous men of their own country, especially after their death; for even that self-love, which made them scarcely bear their superiority whilst they were alive, is honoured by their glory after they are departed.

The great convenience however of this new nomenclature, and the utility of it, which practice has made known, have caused it to be adopted almost universally throughout Europe, sooner or later, and even at Paris M. de Jussieu has established it in the royal garden; thus preferring the public utility to the glory of new-moulding the whole, which the method of natural families, invented by his illustrious uncle, seemed to require⁹. Not that the nomenclature of Linnæus is without its faults, or gives no handle to criticism; but, till a more perfect one shall be found, in which nothing is wanting, it is far better to adopt this than to have none, or to fall again into the phrases of Tournefort or Caspar Bauhin. I can even scarcely believe that a better nomenclature will in future have success enough to proscribe this, to which the botanists of Europe are at present so wholly accustomed; and, having now the double tie of habit and convenience, they will

⁹ The royal garden however is certainly arranged by M. Jussieu's natural method.

renounce it with still more unwillingness than they found in adopting it. In order to bring about such a change, an author must be found with credit enough to efface that of Linnæus; one to whose authority all Europe would be willing a second time to submit; which appears to me not likely to happen. For if his system^r, however excellent it may be, should be adopted by one nation only, it would throw Botany into a new labyrinth, and do it more injury than service.

Even the labour of Linnæus, though immense, remains still imperfect, inasmuch as it does not comprehend all known plants, and is not adopted by all botanists without exception; for the writings of such as do not submit to it require from their readers the same labour to settle the synonyms, as they were forced to take for those which preceded it.

We are obliged to Mr. Crantz, notwithstanding his rage against Linnæus, for having adopted his nomenclature, though he rejected his system. But Haller, in his large and excellent work on the Swiss plants^s, rejects both; and Adanson does more; for he makes an entire new nomenclature, and furnishes no infor-

He should rather have said *nomenclature* or *language*. It is of no great importance what system we adopt, so that we all agree to talk the same language. That of Linnaeus will probably stand the test of ages, whatever may become of the sexual system.

• Alberti v. Haller Historia Stirpium Indigenarum Helvetiæ inchoata. Bernæ 1768 folio, in three volumes.

mation whereby we may refer it to Linnæus's. Haller always quotes the genus, and frequently the specific characters of Linnæus, but Adanson never quotes either. Haller attaches himself to an exact synonymy, by which, even when he does not add Linnæus's enunciation of the species, we may find it at least indirectly by the relation of the synonyms. But Linnæus and his books are absolutely null and void for M. Adanson and his readers, because the latter gives no information whereby we may connect them †. So that we are compelled to choose between Linnæus and M. Adanson, who excludes him without mercy; and to throw all the works of one of them into the fire. Or else we must undertake a new work, which will be neither short nor easy, to connect these nomenclatures, which offer us no point of union.

Linnæus indeed has not given a complete synonymy. For plants known long since, he has contented himself with quoting the Bauhins and Clusius, with a figure of each plant. For exotic plants lately discovered, he has cited one or two modern authors and the figures of Rheed, Rumphius and some others, and has gone no farther. His undertaking did not require of him a more extended compilation, and it is sufficient that he has given one certain information with regard to every plant which he names †.

† Rousseau means to speak here of the *Species Plantarum*, and what he says is in general true of that. But in his *Flora Lapponica, Suecica, &c.* he has given a much more extensive synonymy.

Such is the present state of things. Now after this account of it, I would ask every reader of common sense, how it is possible to attach one's self to the study of plants, and at the same time to reject that of the nomenclature? It is just as if a man would make himself skilful in a language, with a determination not to learn the words of it. The names, it is true are arbitrary, the knowledge of plants has no necessary connexion with the nomenclature; and it is easy to conceive that an intelligent man might be an excellent botanist, without knowing a single plant by its name. But that one man alone, without books or any assistance from communicated information, should become of himself a very moderate botanist, is a ridiculous assertion to make, and an enterprize impossible to execute. The question is, whether three hundred years of study and observation should be lost to Botany, whether three hundred volumes of figures and descriptions should be thrown into the fire, whether the knowledge acquired by all the learned, who have consecrated their purse, their life, their time, to distant, expensive, painful, and dangerous expeditions, should be useless to their successors, and whether every one setting out from nothing, could arrive by himself to the same knowledge, that a long series of enquiry and study has spread over the mass of mankind? If not, and the most lovely part of natural history merits the attention of the curious, let them tell me how we shall manage to make

use of the knowledge heretofore acquired, if we do not begin by learning the language of the writers, and knowing to what objects the names employed by them belong. To admit therefore the study of botany, and to reject that of the nomenclature, is a most absurd contradiction.

L E T T E R S

ON THE

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OF

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L E T T E R S

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OF

B O T A N Y;

TO A L A D Y.

L E T T E R I.

Dated the 22d of August, 1771.

I THINK your idea of amusing the vivacity of your daughter a little, and exercising her attention upon such agreeable and varied objects as plants, is excellent; though I should not have ventured to play the pedant so far as to propose it of myself. Since however it comes from you, I approve it with all my heart, and will even assist you in it; convinced, that at all times of life, the study of nature abates the taste for frivolous amusements, prevents the tumult of the passions, and provides the mind with a nourishment which is salutary, by filling it with an object most worthy of its contemplations.

You have begun with teaching your daughter the names of the common plants which you have about you; this was the very thing you should have done. The few plants which she knows by sight are so many points of comparison for her to extend her knowledge: but they are not sufficient. You desire to have a little catalogue of the most common plants, with the marks by which they may be known. I find some difficulty in doing this for you: that is, in giving you these marks or characters in writing, after a manner that is clear, and at the same time not diffuse. This seems impossible without using the language peculiar to the subject, and the terms of that language form a vocabulary apart which you cannot understand unless it be previously explained to you.

Besides, merely to be acquainted with plants by sight, and to know only their names, cannot but be too insipid a study for a genius like yours; and it may be presumed that your daughter would not be long amused with it. I propose that you should have some preliminary notions of the vegetable structure or organization of plants, in order that you may get some real information, though you were to take only a few steps, into the most beautiful, and the richest of the three kingdoms of nature. We have nothing therefore to do yet with the nomenclature, which is but the knowledge of a herbarist. I have always thought it possible to be a very great botanist without knowing so much

much as one plant by name; and, without wishing to make your daughter a very great botanist, I think nevertheless that it will always be useful to her to learn how to see, whatever she looks at, well. Do not however be terrified at the undertaking: you will soon know that it is not a great one. There is nothing either complicated or difficult in what I have to propose to you. Nothing is required but to have patience to begin with the beginning. After that you may go on no farther than you choose.

We are now getting towards the latter season, and those plants which are the most simple in their structure are already past. Besides, I expect you will take some time to make your observations a little regularly. However in the mean while, till spring puts you in a situation to begin and follow the order of nature, I am going to give you a few words of the vocabulary to get by heart.

A perfect plant is composed of a root, of a stem with its branches, of leaves, flower, and fruit, (for in Botany, by fruit, in herbs as well as in trees, we understand the whole fabric of the seed.) You know the whole of this already, at least enough to understand the term; but there is a principal part which requires an examination more at large; I mean the *fructification*, that is, the *flower* and the *fruit*. Let us begin with the flower, which comes first. In this part nature has inclosed the summary of her work; by this she perpetuates it, and this also is commonly the most brilliant of all parts

of the vegetable, and always least liable to variations.

Take a lily ^a: I believe you will easily find it still in full flower. Before it opens you see at the top of the stem an oblong greenish bud, which grows whiter the nearer it is to opening; and when it is quite open, you perceive that the white cover takes the form of a basin or vase divided into several segments. This is called the *corol*, and not the flower, as it is by the vulgar, because the flower is a composition of several parts, of which the corol is only the principal.

The corol of the lily is not of one piece, as you easily see. When it withers and falls it separates into six distinct pieces, which are called *petals*. Thus the corol of the lily is composed of six petals. A corol, consisting of several pieces like this is called a *polypetalous* corol. If it were all of one piece, like the bell-flower ^b or bind-weeds ^c, it would be called *monopetalous*. But to return to our lily.

You will find exactly in the middle of the corol a sort of little column rising from the bottom, and pointing directly upwards. This, taken in its whole, is called the *pistil* or *pointal*: taken in its parts, it is divided into

^a *Lilium candidum* of Linnæus, or any of its congeners, or almost any of the tribe of these which are called *liliaceous* flowers, are, for the greater part, eminently beautiful.

^b *Campanula rotundifolia* Linnæi.

^c *Convolvulus sepium & arvensis*, &c. Linnæi

three; 1, the swollen base, with three blunted angles, called the *germ* or *ovary*; 2, a thread placed upon this, called the *style*; 3, the style crowned by a sort of capital with three notches: this capital is called the *stigma*.

Between the pistil and the corol you find six other bodies entirely separate from each other, which are called the *stamens*. Each stamen is composed of two parts, one long and thin, by which it is fastened to the bottom of the corol, and called the *filament*; the other thicker, placed at the top of the filament, and called *anther*^d. Each anther is a box which opens when it is ripe, and throws out a yellow dust, which has a strong smell: this is called *pollen* or *farina*.

Such is the general analysis of the parts which constitute a flower. As the corol fades and falls the germ increases, and becomes an oblong triangular capsule, within which are flat seeds within three cells. This capsule, considered as the cover of the seeds, takes the name of *pericarp*.

The parts here mentioned are found in the flowers of most other plants, but in different proportion, situation, and number. By the analogy of these parts, and their different combinations, the families of the vegetable kingdom are determined: and these analogies are connected with others in those parts of the

^d The old English name of anthera is *summit*; Grew called it *semet*.

plant which seem to have no relation to them. For instance, this number of six stamens, sometimes only three, of six petals or divisions of the corol, and that triangular form of the germ, with its three cells, determine the liliaceous tribe; and in all this tribe, which is very numerous, the roots are *bulbs* of some sort or other. That of the lily is *squamous*, or composed of scales; in the Asphodel, it is a number of oblong solid bulbs connected together^e; in the crocus and saffron there are two bulbs, one over the other; in the colchicum^f they are placed side by side^g.

The lily, which I have chosen because it is in season; and also on account of the size of the flower and its other parts, is deficient however in one of the constituent parts of a perfect flower, namely the *calyx*, which is that outer green part of the flower usually divided into five parts or composed of five small leaves; sustaining and embracing the corol at the bottom, and enveloping it

^e As in the peony, potatoe, &c. These are called by some *tuberous* roots.

^f Or meadow saffron.

^g He might have added that some of these bulbs are solid like the turnip; others composed of coats, one over another, as in the onion. Linnæus does not allow them to be roots; and indeed it is only their being underground that led former Botanists to call them so. He names them *Hybernacula*, *winter gems* or *buds*, into which the whole plant retires during the cold season.

entirely before it opens, as you may have remarked in the rose. The calyx which accompanies almost all other flowers, is wanting in the greater part of the liliaceous tribe; as the tulip, the hyacinth, the narcissus, the tuberosa, &c. and even in the onion, leek, garlic, &c. which are also liliaceous, though they appear very different at first sight. You will perceive also that in this whole tribe the stems are simple and unbranched, the leaves entire, and never cut or divided: observations which confirm the analogy of the flower and fruit in this family, by that of the other parts of the plants. If you bestow some attention upon these particulars, and make them familiar to you by frequent observations, you are already in a condition to determine, by an attentive and continued inspection of a plant, whether it be of the liliaceous tribe or not; and this without knowing the name of the plant^h. You see that this is not a mere labour of the memory, but a study of observations and facts truly worthy of a naturalistⁱ. You will not begin

^h If it should happen to be spring when the reader takes up this letter, he may examine the snow-drop, crocus, daffodil, narcissus, crown imperial, tulip, lily of the valley, hyacinth, &c. always taking care in the garden to avoid double flowers. See Letter II.

ⁱ Botany is frequently, but we see here how unjustly, represented as a science which depends wholly upon the memory, as if it were nothing but to get the names of ten thousand plants by heart.

by telling your daughter all this at once ; and still less when in the sequel you shall be initiated in the mysteries of vegetation ; but you will unveil to her by degrees no more than is suitable to her age and sex, by directing her how to find out things of herself, rather than by teaching her^k. Adieu, my dear cousin ; if all this trash be agreeable to you, I am at your service.

^k Rousseau takes every occasion to inculcate this fundamental lesson of education ; and indeed it cannot be inculcated too often. See Letter V.

LETTER II.

The 18th of October, 1771.

SINCE you understand so well, my dear cousin, the first lineaments of plants, though so slightly marked, as to be able already to distinguish the liliaceous family by their air; and since our little botanist amuses herself with corols and petals, I am going to set before you another tribe, upon which she may again exercise her little knowledge; with rather more difficulty I own, because the flowers are much smaller, and the foliage more varied, but with the same pleasure both on her side and on yours; at least if you have as much delight in following this flowery path as I find in tracing it out to you.

When the first rays of spring shall have enlightened your progress, by shewing you in the gardens hyacinths, tulips, narcissuses, jonquils, and lilies of the valley, the analysis of all which is already known to you, other flowers will soon catch your attention, and require of you a new examination: such are stocks^l and rockets^m. Whenever you find them

^l Cheiranthus incanus Linnæi.

^m Hesperis matronalis Linnæi.— Or if these are not at hand, wall-flowers, cabbage, turnip, cole-seed, mustard, charlock, radish, &c.

double,

double, do not meddle with them, they are disfigured; or, if you please, dressed after our fashion: nature will no longer be found among them; she refuses to reproduce any thing from monsters thus mutilated: for if the most brilliant part of the flower, namely the corol, is multiplied, it is at the expense of the more essential parts, which disappear under this addition of brilliancy.

Take then a single stock gilliflower, or stock, as it is vulgarly called, and proceed to the analysis of the flower: you will perceive immediately an exterior part, which was wanting in the liliaceous flowers, namely the calyx. This consists of four pieces, which we must call leaves, leaflets or folioles, having no proper names to express them by, as we have that of petals for the pieces which compose the corol. These four pieces are commonly unequal by pairs; that is, there are two leaflets opposite and equal, of a smaller size, and two others also opposite and equal, but larger, especially towards the bottom, where they are so rounded, as to exhibit a very sensible protuberance or bump on the outside.

In this calyx you will find a corol composed of four petals. I say nothing of their colour, because that makes no part of their character. Each of these petals is fastened to the receptacle, or bottom of the calyx, by a narrow pale part, which is called *unguis*,

or

or the *tail* of the petal, and this spreads out over the top of the calyx into a large, flat, coloured part, called *lamina*, or the *border* ⁿ.

In the centre of the corol is one pistil, long, cylindric, or nearly so; chiefly composed of a germ ending in a very short style, and that terminated by an oblong stigma, which is *bifid*, that is to say, divided into two parts, which are reflected on each side.

If you examine carefully the respective position of the calyx and corol, you will see that each petal, instead of corresponding exactly to each leaflet of the calyx, is, on the contrary, placed between two; so that it answers to the opening which separates them; and this alternate position has place in all flowers which have as many petals to the corol as leaflets to the calyx.

It remains now to speak of the stamens. You will find six of them in the flower of the stock, as in the liliaceous flowers, but not all equal, or else alternately unequal, as in those; but you will perceive two opposite to each other, sensibly shorter than the other four which separate them, and which are also separate from each other in pairs.

I shall not enter here into a detail of their structure and position: but I give you notice

ⁿ I wonder that Rousseau says nothing of the regular structure of this corol, the petals generally standing wide from each other, and forming a figure something like the cross of the order of St. Louis, whence these corols are called *cruciform*, or *cross-shaped*.

that

that if you look carefully you will find the reason why these two stamens are shorter than the other four, and why two leaflets of the calyx are more protuberant, or, as the botanists speak, more gibbous, and the other two more flattened.

To finish the history of our stock; you must not abandon it as soon as you have analysed the flower, but wait till the corol withers and falls, which it does pretty soon; and then remark what becomes of the pistil, composed, as we observed before, of the germ, the style, and the stigma. The germ grows considerably in length, and thickens a little as the fruit ripens. When it is ripe, it becomes a kind of flat pod, called *siliqua*.

This siliqua is composed of two valves, each covering a small cell: and the cells are separated by a thin partition. When the seed is ripe, the valves open from the bottom upwards to give it passage, and remain fast to the stigma at top. Then you may see the flat round seeds ranged along each side of the partition; and you will find that they are fastened alternately to right and left by a short pedicle to the sutures, or each edge of the partition.

I am very much afraid, my dear cousin, that I have fatigued you a little with this long description; but it was necessary to give you the essential character of the numerous tribe of *cruciform* flowers°, which

° See note ⁿ.

forms an entire class in almost all the systems of botanists : and I hope that this description, which is difficult to understand here without a figure, will become more intelligible, when you shall have gone through it with some attention, having at the same time the object before your eyes.

The great number of species in this class ^p has determined botanists to divide it into two sections, in which the flowers are perfectly alike, but the fruits, pericarps, or seed-vessels, are sensibly different.

The first order comprehends the cruciform flowers with a filique, or pod, such as the stock, those mentioned in note ^m, and the like.

The second contains those whose seed-vessel is a *silicle*, that is, a small and very short pod, almost as wide as it is long, and differently divided within ; as whitlow-grass, mithridate-mustard, bastard-crests, &c. in the fields ; and scurvy-grass, horse-radish, candy-tuft, honesty, &c. in the gardens : though the seed-vessel of the last is very large, it is still a *silicle*, because the length exceeds the breadth very little. If none of these are known to you, I presume at least that you are acquainted with the *shepherd's-purse*, which is so common a weed in kitchen gardens. Well then, cousin, this shepherd's-purse is of the cruciform tribe, and the *silicle* branch of it, and the form of the
silicle

^p 286 Species. In the 17th class, diadelphia, or two brotherhoods 695, and in the 19th 1247 species.

filicle is triangular^a. By this you may form some idea of the rest till they fall into your hands.

But it is time to let you breathe; I will only therefore give you a hint at present that in this class, and many others, you will often find flowers much smaller than those of the stock, and sometimes so small that you cannot examine their parts without the assistance of a glass^r; an instrument which a botanist cannot do without, any more than he can without a needle, a lancet, or penknife, and a pair of good scissars. Presuming that your maternal zeal may carry you thus far, I fancy to myself a charming picture of my beautiful cousin busy with her glass examining heaps of flowers, a hundred times less flourishing, less fresh, and less agreeable than herself. Adieu, dear cousin, till the next chapter.

^a The young botanist should be advertised that these filicles or little pods differ much in their form: some are flat, and round or oval; others are spherical or spheroidal, and that of shepherd's-purse has a form peculiar to itself.

^r This of the smallness of the parts in many flowers is an objection that every idle novice makes to the Linnæan system, ever trembling lest any thorn or obstacle, be it ever so minute, should occur in the flowery path: the difficulty however will in great measure vanish, if he will but have patience to go regularly on his way.

L E T T E R I I I .

The 26th of May, 1772.

SINCE you continue, dear cousin, to pursue with your daughter, that peaceable and delightful study which fills up those voids in our time that others dedicate to idleness, or something worse, with interesting observations on nature; I will resume the interrupted thread of our vegetable tribes.

My intention is to describe six of these tribes to you first, in order to render the general structure of the characteristic parts of plants familiar. You have already had two of them; there are four remaining, which you must still have the patience to go through, and after that, quitting for a time the other branches of that numerous race, and going on to examine the different parts of the fructification, we shall manage so, that without knowing many plants perhaps, you will at least never be in a strange country among the productions of the vegetable kingdom.

But I must inform you, that if you will take books in hand, and pursue the common nomenclature; with abundance of names, you will have few ideas, those which you have will be confused; and you will not follow properly either my steps or those of others; but will have at most a mere knowledge of

D

words.

words. I am jealous, dear cousin, of being your only guide in this part of Botany. When it is the proper time I will point out to you the books that you may consult. In the mean time have patience to read nothing but in that of nature, and to keep wholly to my letters.

Peas are, at present, in full fructification. Seize the moment to observe their characters: they are some of the most curious that Botany affords. One general division of flowers is into regular and irregular. The first are they whose parts all spring uniformly from the centre of the flower, and terminate in the circumference of a circle. This uniformity is the reason why when we view flowers of this kind, we do not distinguish an under from an upper part, nor the right from the left; such are the two tribes which we have already examined. But you will see at first sight that the flower of a pea is irregular, that you easily distinguish the longer part of the corol, which should be at top, from the shorter, which should be at bottom; and you know very well, when you hold up the flower to the eye, whether it is in its natural situation or not. Thus in examining an irregular flower, whenever we speak of the top and the bottom, we suppose it to be in its natural situation.

The flowers of this tribe being of a very particular structure, you must not only have
several

several pea flowers, and dissect them successively, to observe all their parts one after another, but you must also pursue the progress of the fructification from the first flowering to the maturity of the fruit.

First you will find a *monophyllous* calyx; that is, one of an entire piece, ending in five very distinct points, the two wider of which are at top, and three narrower at bottom. This calyx bends towards the lower part, as does also the peduncle, or little stalk which supports it: this peduncle is very small and easily moveable; so that the flower readily avoids a current of air, and commonly turns its back to the wind and rain.

Having examined the calyx, you may pull it off, so as to leave the rest of the flower entire, and then you will see plainly that the corol is polypetalous.

The first piece is a large white petal, covering the others, and occupying the upper part of the corol; it is called *standard*, or *banner*. We must make use neither of our eyes nor of common sense, if we do not perceive that this petal is designed to protect the other parts of the flower from the principal injuries of the weather. In taking off the standard, you will observe, that it is inserted on each side by a little process into the side pieces, so that it cannot be driven out of its place by the wind.

The standard being taken off exposes to

view those two side pieces to which it adhered; they are called the wings. In taking these off you will find them still more strongly inserted into the remaining part, so that they cannot be separated without some effort. These wings are scarcely less useful in protecting the sides of the flower than the standard in covering it.

Taking off the wings you discover the last piece of the corol; this is that which covers and defends the centre of the flower, and wraps it up, especially underneath, as carefully as the three other petals envelop the upper part and the sides. This last piece, which on account of its form, is called the boat or keel, is, as it were, the strong box into which nature has put her treasure to keep it safe from the attacks of air and water.

When you have well examined this petal, draw it gently downwards, pinching it slightly by the keel or thin edge, for fear of tearing away what it contains. I am certain you will be pleased with the mystery it reveals when the veil is removed.

The young fruit involved in the boat or keel, is constructed in this manner: a cylindric membrane, terminated by ten distinct threads surrounds the germ, or embryo of the legume or pod. These ten threads are so many filaments, united below round the germ, and terminated each by a yellow anther,

whose farina covers the stigma which terminates the style, or grows along the side of it: this stigma, though yellow with the meal which sticks to it, is easily distinguished by its figure and size. Thus do these ten filaments form also about the germ an interior armour, to preserve it from exterior injuries.

If you examine more curiously, you will find that these ten filaments are united into one at the base, only in appearance^r. For in the upper part of this cylinder there is a piece or stamen which at first appears to adhere to the rest, but as the flower fades and the fruit increases, separates and leaves an opening at top, by which the fruit can extend itself by opening and separating the cylinder gradually; which otherwise, by compressing and straitening it all round, would impede its growth. If the flower is not sufficiently advanced, you will not find this stamen detached from the cylinder; but put a fine pin or needle into two little holes which you will see near the receptacle, at the base of that stamen, and you will soon perceive the stamen with its anther separate from the nine others, which will continue always to form one body, till at length they fade and dry, when the germ becomes a *legume*, and has no longer any occasion for them.

This *legume* is distinguished from the *sili-que* of the cruciform tribe, by the seeds being

^r In many species however the cylinder is entire, and the ten filaments are really united into one.

fastened to one side only of the case, alternately indeed to each valve of it; but all of them to the same side. You will understand this distinction perfectly if you open the pod of a pea and of a stock at the same time, taking care only to have them before they are quite ripe, that, when the pericarp is opened, the seeds may continue fastened by their proper ligaments to their sutures and their valves^s.

If I have made myself well understood, you will comprehend, dear cousin, what astonishing precautions have been heaped together by nature to bring the embryo of the pea to maturity; and, above all, to protect it, in the midst of the greatest rains, from that wet which is fatal to it, without inclosing it in a hard shell, which would have made it another kind of fruit. The Creator, attentive to the preservation of all beings, has taken great care to protect the fructification of plants from attacks that may injure it; but he seems to have doubled his attention to those which serve for the nourishment of man and animals, as does the greater part of the leguminous or pulse tribe. The provision for the fructification of peas is, in different proportions, the same

^s In doing this you will also perceive that the legume is unilocular, or has one cell only; whereas you remember that the silique was said to be bilocular. And if you take a ripe legume you will find that it opens by the upper suture, opposite to that to which the seeds are fastened; whereas the silique opens from the bottom upwards by both sutures.

through this class. The flowers have the name of *papilionaceous*, from a fancied resemblance of them to the form of a butterfly (*papilio*); they have generally a *standard* or *banner*, two *wings*, and a *boat* or *keel*; that is, four irregular petals. But in some genera the boat is divided longitudinally into two pieces almost adhering by the keel; and these flowers have in reality five petals: others, as clover^t, have all their petals united, and though *papilionaceous*, are however *monopetalous* flowers.

The *papilionaceous* or *leguminous* plants form one of the most numerous and useful tribes. Beans, peas, lucerne, saintfoin, clover, lupins, lentils, tares or vetches, indigo, liquorice, kidney-beans, &c. all belong to it: the character of these last is to have the boat spirally twisted, which at first might be taken for an accident. There are also some trees belonging to it; among others that which is commonly called *acacia*, but which is not the true *acacia*^u, and many beautiful flowering shrubs. But of these more hereafter. Adieu, cousin, I wish well to every thing that you love.

^t *Trifolium pratense* *Linnaei*.

^u *Robinia Pseudacacia* *Linnaei*.

LETTER IV.

The 19th of June, 1772.

LET us talk of plants, my dear cousin, whilst the season for observing them invites us. Your solution of my question concerning the stamens of cruciform flowers is perfectly right, and shows that you have understood me, or rather attended to me; for you have nothing to do but to attend, in order to understand. You have accounted very well for the swelling of the two leaflets of the calyx, and the relative shortness of two of the stamens, in the stock, by the bending of these two stamens. One step more would have led you to the primary cause of this structure: for if you ask once more why these stamens are thus bent, and consequently shortened? I answer that, you will find a little gland upon the receptacle, between the stamen and the germ; and it is this gland which, by throwing the stamen to a distance, and forcing it to take a round, necessarily shortens it. Upon the same receptacle are two other glands, one at the foot of each pair of longer stamens; but being on the outside of them, between these stamens and the calyx, they do not oblige them to bend, and therefore do not shorten them: so that the two pair of stamens stand higher than the two single bent ones; not because they are longer,

longer, but because they are straight. These four glands, or at least vestiges of them, are more or less visible in almost all cruciform flowers, and are much more distinct in some than in the stock^v. If you ask me what the glands are for? I answer that, they are one of those instruments destined by nature to unite the vegetable to the animal kingdom, and to make them circulate from one to another. But laying these inquiries aside, in which we anticipate a little too much, let us, for the present, return to our tribes of plants.

The flowers which I have hitherto described to you are polypetalous. I ought perhaps to have begun with the regular monopetalous flowers, which have a much more simple structure, but it was this very simplicity which discouraged me. They constitute rather a great nation than a single tribe; so that to comprehend them all under one common mark, we must employ characters so general and so vague, that whilst we seem to say something, in effect we scarcely say any thing. It is better to confine ourselves within narrower bounds, which we can mark out with more precision.

Among the irregular monopetalous flowers, there is a tribe whose physiognomy is so marked, that we distinguish the members of it easily by their air. It is that to whose flowers Linnæus has given the name of *ringent*, because

^v As in *arabis turrita*, cabbage, mustard, charlock, radish, &c.

they are cut into two lips, the opening of which, whether natural, or produced by a slight compression of the fingers, gives them the air of a gaping mouth. This tribe is divided into two branches: one of *labiate* or ringent flowers, properly so called, and the other of *personate* or masked flowers: the Latin word *persona* signifying a mask. The character common to all the tribe is not only a monopetalous corol, cut into two lips, the upper one called the *casque* or *helmet*, the lower one the *beard*; but also four stamens, almost in the same row, distinguished into two pairs, one longer, and the other shorter. The inspection of the object itself will explain these characters better to you than can be done in writing.

Let us begin with the labiate flowers. For an example I should willingly give you sage, which is common in almost all gardens: but the singular structure of its stamens, which has occasioned some botanists to separate it from the associates, to which it naturally belongs, induces me to look for another instance ^w in the *white dead-nettle*^x, which notwithstanding its name has no affinity with nettles, properly so called, except in the shape of the leaves. This plant is so common every where, and continues so long in flower, that it cannot

^w Rosemary, with some few others not so well known, must also be avoided, because there are only two stamens to the flower.

^x *Lamium album* Linnæi. Curtis II. 45.

be difficult for you to find it^y. Without stopping here to consider the elegant situation of the flowers^z, I will confine myself to their structure. The white dead-nettle bears a monopetalous labiate corol, with the casque or upper lip arched in order to cover the rest of the flower, and particularly the stamens, which keep all four of them very close under cover of its roof. You will easily discern the longer pair and the shorter pair, and in the midst of them the style, of the same colour, but distinguished from them by being forked at the end, instead of bearing an anther like the stamens. The beard or lower lip bends back, and hangs down, so as to let you see the inside of the corol almost to the bottom. In this genus the lower lip is divided lengthwise in the middle, but that is not general in this tribe.

If you pull out the corol, you will take the stamens along with it, those being fastened by the filaments to that, and not to the receptacle, whereon the pistil only will remain. In examining how the stamens are fastened in other flowers, we find them generally attached to the corol in monopetalous, and to the receptacle, or calyx, in polypetalous

^y The largeness of the flowers also makes it proper for examination; but if the smell should be any objection, there is ground-ivy, the other lamiums, betony, horehound, baum, self-heal, baum of gilead, &c.

^z Called verticillate.

flowers : so that in the latter case one may take away the petals without the stamens. From this observation we have an elegant, easy, and pretty certain rule to know whether a corol consists of one piece or several, when it is difficult, as it sometimes is, to be certain of it immediately.

The corol, when pulled off, is open at bottom, because it was fastened to the receptacle, so as to leave a circular opening by which the pistil and what surrounds it may grow up within the tube. That which surrounds the pistil in this dead nettle, and all the labiate tribe, is the rudiment of the fruit, consisting of four embryos, which become four seeds that are naked ; that is, without any pericarp or covering : the monophyllous calyx divided into five segments serving this purpose, so that the seeds, when they are ripe, are detached, and fall to the ground separately. This is the character of the labiate flowers.

The other branch or section, which is that of the *personate* flowers, is distinguished from the former ; first in having the two lips not usually open, or gaping, but closed and joined^a, as you may see in the snap-

^a There are too many exceptions to this to form a general character, if under the idea of personate flowers we include all the plants in the second order of Linnæus's 14th class, as Rousseau seems to do.

dragon,

dragon^b, a flower not uncommon in gardens; or for want of that in the toad-flax, a yellow flower with a spur, so common in the country at this season^c. But a more precise and certain character is, that instead of having four naked seeds at the bottom of the calyx, like the labiate flowers, these have a capsule or case inclosing the seeds, and not opening till they are ripe, in order to disperse them. To these characters we may add that the greater part of the labiate plants are either strong smelling and aromatic, as marjoram, thyme, basil, mint, hyssop, lavender, &c. or else strong smelling and stinking, as the dead-nettles, hedge-nettle, cat-mint, black horehound^d, &c. Some few only having little or no smell, as bugle, self-heal, and hooded willow-herb: whereas most of the plants with personate flowers are not odorous, as snap-dragon, toad-flax, eye-bright, lousewort, yellow rattle, broom-rape, ivy-leaved toad-flax, round-leaved toad-flax, fox-glove^e, &c. I know of none that have a strong smell in this branch but the scro-

^b *Antirrhinum majus* Linnæi. Mill. fig. tom. 42.

^c *Antirrhinum Linaria* Linnæi. Curtis I. 47. —It flowers later with us. Most of the personate tribe flower late.

^d Here, and in some other places, I have taken the liberty of putting plants better known among us, instead of those which Rousseau has given.

^e Some of these have the mouth of the corol gaping.

phularia,

phularia, or figwort, which smells strong, without being aromatic. Here I am not able to name any but such plants as may perhaps be unknown to you; but you will gradually get acquainted with them, and whenever you see them you will be able by yourself to determine what class they belong to. I wish you would try to settle the branch or section by its physiognomy; and that you would exercise yourself in judging at sight, whether a flower is labiate or personate. The exterior form of the corol may suffice to guide you in this choice, which you may verify afterwards by pulling out the corol, and looking at the bottom of the calyx; for, if you have judged right, the flower which you have named labiate will show you four naked seeds, and that which you have named personate will show you a pericarp: the contrary would prove that you was mistaken; and by a second examination of the same plant you would prevent a like mistake another time^f. Here, dear cousin, is business cut out for several walks. I shall not fail to provide something for those that will succeed.

^f This advice will apply in all the other natural classes. From this passage it is clear that by labiate flowers Rousseau understands all that are included in the first order; by personate flowers all that are in the second order of Linnæus's 14th class: but many of the flowers in the second order are labiate.

LETTER V.

The 16th of July, 1772.

COMFORT yourself, my good cousin, for not having detected the glands in the cruciform flowers. Great botanists, and quick-sighted ones too, have not been more happy. Tournefort himself makes no mention of them. They are very visible in but few genera, though we find vestiges of them in almost all; and it is by analysing some of the cruciform flowers, and always observing inequalities in the receptacle, and then examining these inequalities, that we find out that these glands belong to most of the genera; and suppose therefore by analogy that they exist in the others, where we do not distinguish them.

I comprehend that you may not be pleased at taking so much pains, without knowing the names of the plants which you examine. But I own fairly that it did not enter into my plan to spare you that little chagrin. It is pretended that Botany is merely a science of words, which only exercises the memory, and teaches the names of plants. For my part I know not any reasonable study which is a mere science of words; and to which of these shall we give the name of botanist,

to

to him who has a name or a phrase ready when he sees a plant, but without knowing any thing of its structure; or to him who, being well acquainted with this structure, is ignorant nevertheless of the arbitrary name which the plant has in this or that country? If we give our children nothing but an amusing employment, we lose the best half of our design, which is, at the same time that we amuse them, to exercise their understandings, and to accustom them to attention. Before we teach them to name what they see, let us begin by teaching them how to see. This science, which is forgot in all sorts of education, should make the most important part of it. I can never repeat it often enough; teach them not to pay themselves in words, nor to think they know any thing of what is merely laid up in their memory.

However, not to play the rogue with you too much, I give you the names of some plants, with which you may easily verify my descriptions, by causing them to be shown you. For instance, if you cannot find a white dead-nettle, when you are reading the analysis of the labiate or ringent flowers, you have nothing to do but to send to an herborist for it fresh gathered, to apply my description to the flower; and then having examined the other parts of the plant, in the manner which I shall hereafter point out, you

you will be infinitely better acquainted with the white dead-nettle, than the herborist who furnished you with it will ever be during his whole life; in a little time, however, we shall learn how to do without the herborist: but first we must finish the examination of our tribes. And now I come to the fifth which, at this time, is in full fructification.

Figure to yourself a long stem, pretty straight, with leaves placed alternately upon it, generally cut fine, and embracing at the base branches which grow from their *alæ*^f. From the upper part of this stem, as from a centre, grow several pedicles or rays, which spreading circularly and regularly, like the ribs of an umbrella, crown the stem with a kind of basin, more or less open^g. Sometimes these rays leave a sort of void in the middle, and represent, in that case, more exactly the hollow of a basin: sometimes also this middle is furnished with other rays that are shorter, which rising less obliquely form, with the others, nearly the figure of a half sphere with the convex side uppermost.

Each of these rays is terminated not by a flower, but by another set of smaller rays, crowning each of the former exactly as the first crown the stem.

Here then are two similar and successive

^f *Ala* is the angle formed by a leaf or branch with the stem.

^g The figure is that of an inverted cone.

orders: one of large rays, terminating the stem; another of smaller rays, like the others; each of them terminating the great ones^h.

The rays of the little umbels are no farther subdivided, but each of them is the pedicle to a little flower, of which we shall speak presently.

If you can frame an idea of the figure which I have just described, you will understand the disposition of the flowers in the tribe of *umbelliferous* or *umbellate* plants: *umbella* being the Latin word for an umbrella.

Though this regular disposition of the fructification be striking, and sufficiently constant in all the umbellate plants, it is not that however which constitutes the character of the tribe. This is taken from the structure of the flower itself, which must therefore be described.

But it is expedient, for the sake of greater clearness, to give you in this place a general distinction with regard to the relative disposition of the flower and fruit in all plants; a distinction which extremely facilitates their methodical arrangement, whatever system you adopt for that purpose.

The greater number of plants, as the pinkⁱ, for instance, have the germ inclosed within

^h Linnæus calls the first the *universal*; and the second the *partial* umbel.

ⁱ Or jasmine, rosemary, sage, borage, primrose, plum, cherry; all the ringent, cruciform, and papilionaceous tribes; all the compound flowers, &c.

the flower; these are called *inferior flowers*, as inclosing or being below the germ.

Many however have the germ placed below the flower, as in the rose^k; for the hip, which is the fruit of it, is that green tumid body which you see under the calyx, and this with the corol crowns the germ, and does not envelop it, as in the former case: such are called *superior flowers*, as being above the germ.

The umbellate plants have a superior flower. The corol has five petals, called regular, though frequently the two outmost petals of the flowers at the extremity of the umbel are larger than the three others.

The form of these petals varies in the different genera, but it is usually cordate or heart-shaped. They are very narrow next the germ, but gradually widen towards the end, which is emarginate, or slightly notched; or else they finish in a point, which being folded back, gives the petal the air of being emarginate.

Between each petal is a stamen, and the anther generally standing out beyond the corol; the five stamens are more visible than the five petals. I make no mention here of the calyx, because it is not very distinct in the umbellate plants.

^k Scabious, honeysuckle, currant, gooseberry, elder, snow-drop, narcissus, hawthorn, pear, apple, &c.

From the centre of the flower arise two styles, each furnished with its stigma, and sufficiently apparent; these are permanent, or continue after the petals and stamens fall off, to crown the fruit.

The most usual figure of this fruit is an oblong oval; when ripe it opens in the middle, and is divided into two naked seeds fastened to the pedicle, which with an art that merits our admiration, divides in two, as well as the fruit, and keeps the seeds separately suspended till they fall.

All these proportions vary in the different genera, but this is the most common order. It requires a very attentive eye to distinguish accurately objects so minute without a glass; but they are so deserving of attention, that we cannot regret the trouble of it.

This then is the proper character of the umbellate tribe. A superior corol of five petals, five stamens, two styles, upon a naked fruit composed of two seeds growing together.

Whenever you find these characters united in one fructification, be sure that the plant is of this tribe, even though in other respects it should have nothing in its arrangement of the order before laid down. And if you should find all this order conformable to my description, and see it however contradicted by the examination of the flower, be sure that you are deceived.

For instance, if it should happen that after having

having read my letter you should walk out and find an elder in flower I am almost certain that at first sight you would say, here is an umbellate plant. In looking at it, you would find a large or universal umbel, a small or partial umbel, little white flowers, a superior corol, and five stamens; it is certainly an umbellate plant, say you. But let us see, let us take a flower.

In the first place, instead of five petals, I find a corol divided into five parts indeed, but all of one piece. Now the flowers of umbellate plants are not monopetalous. There are five stamens, but I see no styles, and I more often see three stigmas than two; more often three seeds than two. Now the umbellate plants have never more or less than two stigmas, and two seeds to each flower. Lastly, the fruit of the elder is a soft berry, and that of the umbellate tribe dry and naked. The elder then is not an umbellate plant.

If now you go back and inspect with more accuracy the disposition of the flowers, you will see that the elder has the structure of the umbellate tribe only in appearance. Though the principal rays proceed from the same centre; the smaller ones are irregular, and the flowers are born on a second subdivision: in short, the whole has not that order and regularity which we find in the umbellate plants. The arrangement of the flowers in the elder is called a *cyme*. Thus by making a blunder

sometimes, we learn to see with more accuracy.

Eryngo, on the contrary, has little or nothing the air of an umbelliferous plant, and yet it is one, because it has all the characters of the fructification. If you were by the sea side¹, you would easily know it by the bluish colour of the leaves, by their prickliness, and by the smooth membranous consistence of them like parchment. But this plant is uncommon in other situations, is rough and untractable, has not beauty enough to make you amends for the wounds it will give you in examining it; and though it were ever so beautiful, my little cousin would soon be disgusted at handling so ill-humoured a plant.

The umbelliferous tribe is numerous, and so natural, that it is very difficult to distinguish the genera: they are relations, whom we often take for each other, on account of their great resemblance. To assist us in distinguishing them, principal differences are noticed which are sometimes useful, but which we must not depend upon too much. The focus of the rays both in the larger or universal, and in the smaller or partial umbel, is not always naked; it is sometimes surrounded with small leaves. This set of small leaves or folioles is called *involucre*. When it is placed at the origin of the universal umbel, it is named the universal involucre;

¹ Eryngo is also very common by road sides in France, but not with us.

and

and when at the origin of the partial umbel, it is named the partial involucre. This gives rise to three sections of umbellate plants.

1. Those which have both involucre.
2. Those which have partial involucre only.
3. Those which have neither.

There seems a fourth division wanting of those which have an universal involucre only; but there is no genus which is constantly so.

Your astonishing progress, my dear cousin, and unwearied patience, have emboldened me so much, that not regarding your sufferings, I have ventured to describe the umbellate plants, without fixing your eyes upon any model, which must needs have rendered your attention much more fatiguing. I am certain, however, that, reading as you do, after you have looked over my letter once or twice, an umbellate plant in flower will not escape you; and at this season you cannot fail finding many, both in the gardens and the fields.

Most of them have their little flowers white. As the carrot, chervil, parsley, hemlock, fool's parsley, angelica, cow parsnep, water parsnep, burnet saxifrage, pig nuts, cow weed, &c.^m.

Some, as fennel, dill, parsnep, have yellow flowers; there are some few with reddish flowers, but none of any other colour.

^m Here, and in other places, I set down the names of Hudson's Flora.

Here, you will tell me, may be a good general notion of umbellate plants; but how will all this vague knowledge ensure me from confounding fool's parsley with true parsley or chervil, which you have mentioned all together? The meanest kitchen-maid will know more of this matter than we with all our learning. You are right. But however if we begin with observations in detail, we shall soon be overwhelmed with the number of them; our memory will abandon us, and we shall be lost the first step we make in this vast region; whereas if we begin with knowing the great roads well, we shall seldom be lost in the by-paths, and shall always find our way again without much trouble. Let us, however, admit an exception in favour of the utility of the object, and let us not expose ourselves, whilst we are analysing the vegetable kingdom, to eat fool's parsley with our meat, or in our soup, through mere ignorance.

This plant, which is so common a weed in gardens, is of the umbellate tribe, as well as parsley and chervil. It has a white flower as well as theyⁿ, it is in the same section with the latter, among those which have the partial,

ⁿ The flower of parsley is yellowish. But the flowers appear yellow in many of the umbellate plants, from the germ and anthers being so, though the corol is white. *Roussseau*.—The germ and anthers also are frequently large in proportion to the size of these minute flowers, and the corol easily falls off, especially with wet.

and not the universal involucre; it is so like them in its foliage that it is not easy to mark the difference in writing. But here follow characters sufficient to prevent you from being mistaken.

You must consider these plants when they are all in flower; for in that state only they have their proper character. The fool's parsley (*æthusa cynapium*) has under every partial umbel an involucre of three narrow, long, pointed folioles, all placed on the outer part of the umbel, and hanging down; whereas the folioles of the partial umbels in the chervil surround it entirely, and grow equally on every side: and as to parsley, it has only a few short folioles, fine almost as hairs, and distributed indifferently at the base of both umbels.

When you are very certain of the fool's parsley in flower, you will confirm yourself in your judgment by slightly bruising and smelling its foliage; for the disagreeable venomous smell will no longer suffer you to confound it with parsley or chervil, which have both rather a pleasant smell. Very certain at length, not to make a mistake, you will examine these three plants together and separately in every state, and in all their parts, especially in their foliage, which accompanies them more constantly than the flower; and by this examination compared and repeated, till you have acquired certainty at sight, you will be able to know and distinguish them without the least trouble. Thus
does

does study bring us to the very door of practice; after which the latter confers the facility of knowing things.

Take breath, dear cousin, for this is an unconscionable letter; and yet I dare not promise you more discretion in the next; after that however we shall have nothing before us but a path bordered with flowers. You deserve a garland for the cheerfulness and perseverance with which you have condescended to follow me through these briars, without being discouraged at their thorns.

LETTER VI.

May the 22d, 1773.

THOUGH there is still, dear cousin, a great deal wanting to complete our idea of the five former tribes of plants, and I have not always known how to adapt my descriptions to the understanding of our young botanist; I flatter myself however that I have given you such an idea of them, as to enable you, after some months herborization, to render the *air*, *port*, or *habit* of each tribe familiar to you : so, that when you see a plant, you may conjecture nearly whether it belongs to one of these five tribes, and to which; provided always that by an analysis of the fructification, you afterwards see whether you may not have been deceived in your conjecture. The umbellate plants, for instance, have thrown you into some embarrassment, from which however you may easily escape when you please, by means of the hints which I have subjoined to my descriptions. In short, carrots and parsneps are so common, that nothing is easier in the middle of summer than for the gardener to send you one or other of them in flower out of the kitchen garden. Now from the mere view of an umbel, and the plant which bears it,

it, you must acquire so clear an idea of the umbellate tribe, that you will rarely be deceived at first sight, whenever you meet with one. This is all that I have hitherto pretended; for we have nothing to do yet with genera and species; and I repeat it once more, that it is not the nomenclature of a parrot which I wish you to acquire, but a real science, and one of the most delightful sciences that it is possible to cultivate. I go on therefore to our sixth tribe before I take a more methodical road. It may perhaps at first embarrass you as much, if not more than the umbellate plants. But my design at present is nothing more than to give you a general notion of it, especially as we have still plenty of time, before the generality of these plants are in full flower; and the interval, well employed, will smooth those difficulties against which we have not strength to contend.

Take one of those little flowers which, at this season, cover all the pastures, and which every body knows by the name of *daisy*. Look at it well, for by its appearance, I am sure you will be surprised when I tell you, that this flower, which is so small and delicate, is really composed of between two and three hundred other flowers, all of them perfect; that is, having each its corol, germ, pistil, stamens, and seed; in a word, as perfect in its species as a flower of the hyacinth or lily. Every one of those leaves which are white above and red underneath,

underneath, and form a kind of crown round the flower, appearing to be nothing more than little petals, are in reality so many true flowers; and every one of those tiny yellow things also which you see in the centre, and which at first you have perhaps taken for nothing but stamens, are real flowers. If your fingers were already exercised in botanical dissections, and you were armed with a good glass, and plenty of patience, I might convince you of the truth of this; but at present you must begin, if you please, by believing me on my word, for fear of fatiguing your attention upon atoms. However, to put you at least in the way, pull out one of the white leaves from the flower; you will think at first that it is flat from one end to the other; but look carefully at the end by which it was fastened to the flower, and you will see that it is not flat, but round and hollow in form of a tube; and that a little thread ending in two horns issues from the tube; this thread is the forked style of the flower, which, as you now see, is flat only at top.

Now look at those little yellow things in the middle of the flower, and which as I have told you are all so many flowers; if the flower be sufficiently advanced, you will see several of them open in the middle, and even cut into several parts.

These are monopetalous corols which expand, and a glass will easily discover in them
the

the pistil, and even the anthers with which it is surrounded. Commonly the yellow florets towards the centre are still rounded and closed. These however are flowers like the others, but not yet open; for they expand successively from the edge inwards. This is enough to show you by the eye, the possibility that all these small affairs, both white and yellow, may be so many distinct flowers; and this is a constant fact. You perceive, nevertheless, that all these little flowers are pressed, and inclosed in a calyx, which is common to them all, and which is that of the daisy. In considering then the whole daisy as one flower, we give it a very significant name, when we call it a *compound flower*. Now there are many genera and species of flowers formed, like the daisy, of an assemblage of other smaller flowers, contained in a common calyx. This is what constitutes the sixth tribe, of which I proposed to treat, namely that of the *compound flowers*.

Let us begin by avoiding all ambiguity with regard to the word flower, which we may do in the present case by restraining it to the compound flower, and giving the name of *floscules* or *florets* to the little component flowers; but in the midst of this verbal precision let us not forget that each of these florets is a genuine flower.

You have observed two sorts of florets in the daisy: the yellow ones, which occupy the
2 middle

middle or disk of the flower, and the little white tongues or straps which surround them.

The former are something like the flowers of the lily of the valley, or hyacinth, in miniature: and the latter bear some resemblance to those of the honeysuckle. We shall leave to the first the name of *florets*; and to distinguish the second we shall call them *semi-florets*: for in reality they have a little the air of monopetalous flowers gnawed off on one side, and having scarcely half the corol remaining.

These two sorts of florets are combined in the compound flowers in such a manner, as to divide the whole tribe into three sections, very distinct from each other.

The first section consists of those which are entirely composed of semiflorets, both in the middle and circumference; these are called *semi-flosculous flowers*, and the whole is always of one colour, which is generally yellow. Such is the common dandelion, the lettuce and sowthistle; the succory and endive, which have blue flowers; the scorzonera, falfafy, &c.

The second section comprehends the *flosculous flowers*, or such as are composed of florets only: these are also commonly of one colour; as immortal flowers, burdock,

• Linnaeus also calls these *ligulate flowers*, from *ligula* a strap.

worm-

wormwood, mugwort, thistles, and artichoke, which is nearly allied to them : it is the calyx of this that we suck, and the receptacle that we eat, whilst it is yet young, before the flower opens, or is even formed. The choke, which we take out of the middle, is an assemblage of florets which are beginning to be formed, and are separated from each other by long hairs fixed in the receptacle.

The third section is of flowers composed of both these. They are always so arranged that the florets occupy the centre of the flower, and the semi-florets the circumference, as you have seen in the daisy. The flowers of this section are called *radiate*. Botanists have given the name of *ray* to the set of semi-florets which compose the circumference ; and of *disk* to the area or centre of the flower occupied by the florets. This name of disk is sometimes given to the surface of the receptacle in which all the florets and semi-florets are fixed. In the radiate flowers the disk is often of one colour, and the ray of another ; there are, however, genera and species in which both are alike.

Let us endeavour now to fix in your mind an idea of a *compound flower*. The common clover is in blow at this season ; the flower is purple : if you should take one in hand, seeing so many little flowers assembled, you might be tempted to take the whole for a compound flower. You would however be
I
mistaken ;

mistaken; in what? say you. Why in sup-
 posing that an assemblage of many little flow-
 ers is sufficient to constitute a compound
 flower: whereas, besides this, one or two
 parts of the fructification must be common to
 them all; so that every one must have a part
 in it, and no one have its own separately:
 these two parts in common are the calyx
 and receptacle. The flower of the clover
 indeed, or rather the group of flowers, which
 has the appearance of being but one flower,
 seems at first to be placed upon a sort of
 calyx; but remove this pretended calyx a
 little, and you will perceive that it does not
 belong to the flower, but that it is fastened
 below it to the pedicle that bears it. This
 then is a calyx only in appearance; but in
 reality it belongs to the foliage, not to the
 flower; and this supposed compound flower
 is only an assemblage of very small legumi-
 nous or papilionaceous flowers, each of which
 has its distinct calyx, and they have nothing
 common to them but their being fastened to
 the same pedicle. Vulgarly all this is taken
 for one flower; it is a false idea however, or
 if we must look upon it as such, we must not
 at least call it a compound, but an *aggregate*
 or *capitate* flower, or a *head* of flowers; and
 these terms are sometimes so applied by bo-
 tanical writers.

This, dear cousin, is the most simple and
 natural notion I can give you of this nu-
 F merous

merous class of compound flowers, and the three sections into which it is subdivided. I now come to the structure of the fructifications particular to this class, and this perhaps will bring us to determine the character of it with more precision.

The most essential part of a compound flower is the receptacle; upon which are placed first the florets and semi-florets, and then the seeds which succeed them. This receptacle, which forms a disk of some extent, makes the centre of the calyx, as you may see in the dandelion, which we will here take as an instance. The calyx in this tribe is commonly divided into several parts, down to the base, that it may close, open again, and turn back, as it does during the progress of the fructification, without being torn. The calyx of the dandelion is formed of two rows of folioles, inserted into each other; and the folioles of the outer row turn back and curl downwards towards the pedicle, whilst the folioles of the inner row continue straight, to surround and hold in the semi-florets composing the flower.

One of the most common forms also of the calyx in this class is the *imbricate*, or that which is made up of several rows of folioles, laying over each other like tiles on a roof. The artichoke, blue-bottle, knapweeds, and scorzoneras, may serve as instances of imbricate calyxes.

The

The florets and semi-florets inclosed within the calyx are placed very thick upon the disk or receptacle in form of a quincunx, or the checks upon a chess-board. Sometimes they touch each other without any thing interposed between them; sometimes they are separated by partitions of hairs, or small scales, which continue fast to the receptacle after the seeds are fallen. You are now in the way to observe the differences of calyxes and receptacles: we will go on then to the structure of florets, and semiflorets, beginning with the former.

A floret is a monopetalous flower, commonly regular, with the corol divided at top into four or five parts. The five filaments of the stamens are fastened to the tube of this corol: they are united at top into a little round tube, which surrounds the pistil, and this tube is the five anthers united circularly into one body. This union of the anthers, according to modern botanists, forms the essential character of compound flowers, and belongs to their florets only, exclusively of all others. If therefore you find several flowers upon the same disk, as in the scabiouses and teasels, unless the anthers are united in a tube round the pistil, and the corol stands upon one naked seed; such flowers are not florets, nor do they form a compound flower. On the contrary, whenever you find in a single flower the anthers

thus united, and a superior corol on a single seed, this flower, though sole, is a genuine floret, and belongs to the compound tribe; for it is better thus to take the character from a precise structure than from a deceitful appearance.

The pistil has the style generally longer than the floret, above which it rises through the tube formed by the anthers. It is most frequently terminated at top by a forked stigma, the two curling horns of which are very visible. The pistil does not rest upon the receptacle any more than the floret, but both upon the germ, which serves them as a base, and grows and lengthens as the floret withers, becoming in time a longish seed, remaining fastened to the receptacle till it is ripe: then it falls, if it be naked, or the wind wafts it to a distance if it be crowned with an egret of feathers or hairs, and the receptacle remains quite naked in some genera, but is furnished with scales or hairs in others.

The structure of the semiflorets is like that of the florets; the stamens, the pistil, and the seed, are arranged almost in the same manner; only in the radiate flowers there are many genera, wherein the semiflorets of the ray are apt to be abortive, either because they have no stamens, or because those which they have are barren: in such cases the flower seeds only by the florets in the middle ^P.

^P Sunflower.

In

In the whole compound class, the seed is always sessile, that is, it bears immediately upon the receptacle without any intermediate pedicle. But there are seeds in which the down or egret which crowns them is sessile^a; and others in which it is fastened to the seed by a pedicle^r. You understand that the use of this down is to spread the seeds about to a distance, by giving the air more hold upon them.

To these irregular imperfect descriptions I should add that the calyx has generally the property of opening when the flower expands; of closing when the florets fall off, in order to confine the young seed, and to hinder it from falling before it is ripe; and lastly, of opening again and turning quite back to give a larger area to the seeds which increase in size as they grow ripe. You must often have seen the dandelion in this state, when children gather it, to blow off the down that forms a ball round the reverted calyx.

To understand this class well, you must follow the flowers from before their expansion to the full maturity of the fruit; and in this succession you will see transformations and a chain of wonders, which will keep every sensible mind that observes them in a continual admiration. One flower proper for these observations is the sunflower, which

^a Thistles, artichoke.

^r Lettuce, dandelion.

is radiate; as are also ox-eye, Chinese aster, and many others, which are the ornament of the borders in autumn. I have already said that there are thistles for the flosculous, and scorzonera and dandelion for the semi-flosculous flowers. All these are large enough to be dissected, and studied with the naked eye, without fatiguing yourself too much.

I will not trouble you at present any more upon the tribe or class of compound flowers. I tremble already at having abused your patience too much by details which would have been clearer if I had known how to make them shorter; but it is impossible for me to avoid the difficulty arising from the smallness of objects. Adieu, dear cousin.

LETTER VII.

HERE, dear cousin you have the names of those plants which you sent me last. I have put a mark of interrogation to those which I had any doubt of, because you had not taken care to put the leaves with the flower, and they are often necessary to determine the species, especially to so slender a botanist as I am. When you arrive at Fourriere you will find most of the fruit-trees in flower; and I remember you requested some directions from me upon this article. At present I can only give you some hints upon the subject, because I am very busy; and yet I would not have you lose the season for this examination.

You must not, my dear friend, give more importance to Botany than it really has; it is a study of pure curiosity, and has no other real use than that, which a thinking sensible being may deduce from the observation of nature and the wonders of the universe.

Man has changed the nature of many things to convert them better to his own use; in that he is not to be blamed; but then it is nevertheless true that he has often disfigured them, and that when he thinks he is studying nature in the works of his own hands, he is frequently mistaken. This error

is found above all in civil society ; but it has a place also in gardens. The double flowers, which we admire so much in our borders and beds, are but monsters, deprived of the power of producing their like ; a power with which nature has endowed every organized being. Fruit-trees are somewhat in the same case, by being ingrafted ; you may plant the pips or seeds of pears and apples of the best sorts, but they will produce nothing but wildings. To know then the pear and the apple of nature, you must not look for them in orchards, but in woods. The flesh or pulp is not so large and succulent, but the seeds ripen better, multiply more, and the trees are vastly bigger, and more vigorous. But I am entering on a subject that would carry me too far : let us return to the orchard.

Our fruit-trees, though ingrafted, preserve all the botanical characters which distinguish them ; and it is by an attentive consideration of these characters, as well as by the transformation of the graft, that we ascertain there being but one species of pear, for instance, under a thousand different names, by which the shape and taste of their fruits has caused them to be distinguished into so many pretended species, which are at bottom, but varieties : nay more, the pear and apple are only two sorts or species of the same kind or genus, and their only characteristic difference

difference is, that the stalk of the apple enters into a hollow in the fruit, and that of the pear is fastened to the narrow part of a fruit a little lengthened out*. In the same manner the different sorts of cherries are nothing but varieties of the same species; all the plums are but one species of plum; nay the genus of *prunus* or plum contains three principal species; the plum properly so called, the cherry and the apricot, which also is only a species of plum. Thus when the learned Linnæus, in dividing the genus into its species, has enumerated the domestic plum, the plum cherry, and the plum apricot†; ignorant people have laughed at him, but observers have admired the justness of his arrangement.

The fruit-trees belong mostly to a numerous tribe, which has a character not difficult to seize; the stamens, which are many in number, instead of arising from the receptacle, are fastened to the calyx, either imme-

* Nor is this always constant, some pears having the common shape of the apple. It is extremely difficult to find any permanent differences between fruits, which are distinguished by every body at first sight. We may add, however, that the corols of the pear are white, those of the apple red on the outside; the apple also has a firmer pulp, and none of those tubercles which some sorts of pear have: and, lastly, the leaves of the pear are very smooth; those of the apple more rounded, less serrated, and villous underneath.

† *Prunus domestica*. *Prunus Cerasus*. *Prunus Armeniaca*.

diately

diately, or with the corol, which is polypetalous, and consists commonly of five petals. The following are characters of some of the principal genera.

The pear, comprehending also the apple and the quince, has the calyx monophyllous, divided into five segments; the corol of five petals fastened to the calyx, about twenty stamens, all fastened likewise to the calyx. The germ is inferior, and there are five styles. The fruit, as every body knows, is fleshy, and has five cells containing the seeds.

The genus plum, comprehending the apricot and cherry, as was before observed, and also the laurel, has the calyx, corol, and stamens nearly as in the pear. But, the germ is superior, or within the corol; and there is but one style. The fruit is rather watery than fleshy, and contains a stone.

The genus almond, including the peach and nectarine, is almost like the plum, but the germ has a down upon it, and the fruit, which every body knows is succulent in the peach, and dry in the almond, incloses a hard stone, which is rough and full of cavities^u.

All this is very roughly sketched out, but I hope contains enough to amuse you for the present. Adieu, dear cousin.

^u Besides those mentioned above, this class, called *icosandria* by Linnæus, contains other fruits, as the pomgranate, service, medlar, raspberry, strawberry, &c.

LETTER VIII.

April the 11th, 1773.

THE earth, dear cousin, begins to put on its green robe, the trees to bud, the flowers to open; some are even already past; an instant of delay would be the loss of a whole year for Botany: I proceed then without farther preamble.

I fear we have hitherto treated our subject in too abstract a way, by not having applied our ideas to determinate objects: it is a fault which I have been guilty of, especially in the umbellate tribe. If I had begun by setting one of them before your eyes, I should have spared you a very fatiguing application to an imaginary object, as well as a very difficult description to myself, and such as a single look would have supplied. Unfortunately, at a distance to which the law of necessity restrains me, I am not able to deliver the objects into your hand; but provided each of us can but see with the same eyes, we shall understand one another very well, when we relate what we see. The whole difficulty is, that the indication must come from you; for to send you dried plants from hence, would be doing nothing. To know a plant well you must begin with seeing it growing. *A hortus siccus*, by which
Latin

Latin term we call a collection of dried plants, may serve to put us in mind of the plants we have once known; but gives us only a poor knowledge of those which we have never seen before. You therefore must send me such plants as you wish to know, and have gathered yourself; and it is my business to name, class, and describe them; till by comparative ideas, become familiar to your eyes and your understanding, you arrive at classing, ranging, and naming, by yourself, those which you see for the first time: and this is the science which distinguishes the true botanist from the mere herbarist or nomenclator. My design then here is to learn you how to prepare, dry, and preserve plants, or specimens of plants, in such a manner as that they may be easily known and determined. In a word, I propose to you to begin a *hortus siccus*. Here is a deal of business preparing at a distance for our little botanist: for at present, and for some time to come, the address of your fingers must supply the weakness of hers.

First, here is some provision to be made; namely, five or six quires of gray paper, and almost as many of white, of the same bigness, pretty strong and well sized, without which the specimens would rot in the gray paper, the plants or at least the flowers would lose their colour, and this, of all the parts, is that by which they are most easily known, and which it is most pleasant to see in a collection

lection of dried plants ^v. It were also to be wished that you had a press of the same size with your paper, or at least two pieces of board well planed, between which you may keep your papers and specimens, pressed by stones or any other weight, with which you may load the upper plank. When you have made these preparations, you must observe the following rules, in order to prepare your plants so as to preserve them and know them again.

The precise time to gather your plant is when it is in full flower, or rather when some of the flowers begin to fall, to give place to the fruit, which begins to make its appearance. It is at this time, when all parts of the fructification are visible, that you must endeavour to gather the plant in order to dry it.

Small plants may be taken whole with their roots, which must be brushed, that no earth may remain. If the earth is wet, it

^v I make use only of what we vulgarly call whited-brown paper, unless I have red, commonly called blotting paper, which is preferable to all others, because it is the most absorbent. I change the specimens at least once a day, separating those which dry quick, from others that are more succulent, and therefore both require more time, and more frequent changing: always shifting them into very dry papers. When the specimens are well dried and quite stiff, I lay them by in large strong white or cartridge paper. Some particular plants require more attention to preserve their colours, and others lose their colours with all the care we can take.

must

must either be dried, that it may be brushed, or else the root must be washed; but in this case you should wipe it well, and dry it before you put it into the papers, without which it would infallibly rot and injure the plants near it. You need not however preserve the roots, unless they have some remarkable singularities; for in most plants the branching fibrous roots are so alike, that it is not worth the trouble. Nature, which has done so much for elegance and ornament, in the form and colour of plants, in whatever strikes our sight, has destined the roots entirely to useful functions; because being concealed within the earth, to give them an agreeable structure, would have been to hide the light under a bushel.

Trees and all great plants can only be had by specimens: but then that specimen should be so well chosen, as to contain all the constituent parts of the genus and species, that it may suffice to know and determine the plant from whence it is taken. It is not sufficient that all the parts of the fructification are distinguishable, which would be enough to determine the genus; but the character of the foliation and ramification also must be sufficiently visible; that is, the origin and form of the leaves and branches, and even as much as may be some portion of the main stem itself; for as you will see in

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the sequel ; all this serves to distinguish the species of the same genus, which are perfectly alike in the flower and fruit. If the branches are too thick, they may be made thinner, by cutting them with a sharp knife nicely underneath, as much as may be, without cutting and mutilating the leaves. There are botanists who have the patience to slit the bark, and draw the wood out so nicely, that when the bark is united again, the branch seems to be entire though the wood is gone: by which means there are none of those inequalities and bumps, which spoil and disfigure a collection, and give a bad form to the plants. Where the flowers and leaves do not come out at the same time, or grow too far distant from each other, you will take a little branch in flower, and another in leaf, and placing them together on the same leaf of your book, you thus have before you different parts of the same plant, sufficient to give you a complete knowledge of it. As to plants where you find only the leaves, the flower being either past or not yet come, you must wait with patience till they show their faces, to be fully acquainted with them. A plant being no more certainly to be known by its foliage than a man by his clothes.

Such is the choice that you should make in what you gather: you must have a choice also as to the time in which you do it.

Plants

Plants gathered in the morning before the dew is off, or in the evening when it is damp, or in the day-time when it is wet, will not keep. You must absolutely choose a dry season, and even then, the driest and hottest time of the day, which in summer is between eleven in the morning and five in the afternoon. Even then, if you find the least moisture on them, you must not take them, for they will certainly not keep.

When you have gathered your specimens, you must bring them home as soon as you can, quite dry, to put and arrange them in your papers. For this purpose you lay down at least one sheet of gray paper, upon this half a sheet of white paper, and then your plant, taking great care that all the parts of it, especially the leaves and flowers, are well opened, and laid out in their natural situation. If the plant is a little withered, without being too much so, it will generally spread out better upon the paper, with the fingers and thumb. But there are rebellious plants which start up on one side, whilst you are ranging them on the other. To prevent this inconvenience, I have leads, halfpence, and farthings, which I place upon those parts that I have just put in order, whilst I am arranging the rest, so that when I have done, my plant is almost covered with these pieces, which keep it in its proper situation. Then you place another half sheet of white paper upon

upon the first, pressing it with your hand, to keep the plant in the position you have given it, bringing your left hand that presses gradually forward, and at the same time taking away the leads, &c. with your right; then put another sheet of gray paper upon the second white paper, all the while pressing the plant, lest it lose the position you have given it: upon the gray paper place another half sheet of white, as before; upon this another plant arranged and covered like the former, till you have placed your whole harvest, which ought not to be too numerous at once; both that your task may not be too laborious, and that your paper may not contract too much humidity during the drying; which would infallibly spoil your plants, unless you hastened to change the papers with the same attention as before; this however is what you must do from time to time, till your specimens have taken their bent, and are all very dry.

Your pile of plants and papers thus arranged, must be put into the press, without which your plants will not be flat and even; some are for pressing them more, others less; experience will teach you this, as well as how often the papers should be changed, without taking unnecessary pains. Lastly, when your plants are quite dry, put each of them separately into a sheet of paper, one upon another, without other papers be-

tween, for which there is no occasion, and you will thus begin a *hortus siccus*, which will continually increase with your knowledge, and at length contain the history of all the vegetation of the country. Take care always to keep your collection very close, and a little pressed; without which the plants, however dry they might be, will attract the humidity of the air, and again get out of form.

Now the use of all these pains is to arrive at a knowledge of each particular plant, and to understand one another well when we talk of them.

For this purpose you must gather two specimens of each plant: one larger to be kept, the other smaller to send me. You must number them carefully, so that both great and little specimen shall always have the same number. When you have a dozen or two of species thus dried, you will send them to me in a little parcel by the first opportunity. I will send you back their names and descriptions; by means of the numbers you will know them in your collection, and after that in their natural state, wherein, I presume, you first examined them. This is the certain way to make as secure and rapid a progress as you can, at a distance from your guide.

P. S. I forgot to tell you that the same papers may serve over and over again, provided

vided you take care to air and dry them well. I should also add here, that your *hortus siccus* must be kept in the driest part of the house, and rather on the first than the ground-floor.

L E T T E R IX.

March the 25th, 1774.

I Have received all your packets very safe, and cannot but admire the neatness with which you have arranged your plants; the care you have taken in having all the parts necessary to determine both the genus and species in your specimens; and the brilliancy of colour in most of the flowers. All this serves to show how much better the female fingers are adapted to such operations than ours. I am pleased also to hear that our little botanist had so large a share in laying out and drying these plants, which I shall carefully preserve as a memorial of the industry and adroitness of both. But what gives me the most pleasure is, to see that you have remarked with so much success in general, to which of the natural classes your plants belong: so that I am well convinced you have profited by my lessons, and have paid a due attention to my letters.

What reward, dear cousin, can I give you for your unwearied patience and perseverance in following me through so much abstract matter, when your curiosity must needs have been piqued, and your desire of being acquainted with the rank and names of the beautiful objects which you gathered,
arranged,

arranged, and dried, with so much affection, must have been awakened? I have now, in some degree, endeavoured to content you, by the paper which accompanies this, containing the names of all the plants in your packets, placed after the numbers which you have put to them in your collection: so that to the common objects which you knew by rote, you are now enabled to add a considerable number, whose acquaintance you will value more, because you know them, upon thorough examination. You have therefore so many more points to rest upon; but this is not sufficient; you cannot be a botanist till you are able to help yourself, to cast me off entirely, and to find out a plant with which you are unacquainted. All this, however, will still require some time and patience; and as you remember that you are not to take any more steps in this kingdom than are agreeable, you will inform me when you are tired.

Such information I propose now to convey to you by degrees: and having initiated you by showing how you may determine the class of some plants, I will now open the whole mystery, and instruct you how to determine the class of them all. To do this you must learn a system; in which however you are not to expect that all vegetables are arranged in natural classes, such as I have hitherto explained to you, but after an arti-

ficial method, the order of nature not being in all points yet unveiled to our mortal eyes. Your pains however will not have been thrown away; because I promise you that our artificial system shall preserve the natural tribes which you have studied so well.

Do not suffer yourself to be terrified at the word *system*. I promise you there shall be little difficulty in it to you who have patience and attention; and as little parade of hard words as possible, only allowing me to name my classes and orders^a. The system I propose to you is not the French one by Tournefort, which is very beautiful, and has great merit; but the Swedish one by Linnæus. I prefer this, because it is most complete, and most in fashion.

You are so well acquainted with all the constituent parts of the fructification, that you need not be told what the stamens and pistils are. Linnæus has founded his classes upon the former, and many of his orders upon the latter of these. But at present the classes will furnish you with sufficient employment.

I suppose you take a plant in hand that

^a The English student will find great advantage in possessing many elementary books, explaining all the terms, in his own language. Now also he has Linnæus's system of vegetables and genera translated. And Hudson's *Flora Anglica* connects the English names with those of Linnæus.

is in full flower; the first thing you have to see is, whether the flowers are complete or perfect, that is, have both stamens and pistils: if so, view the stamens well, in order to discover whether they are entirely separate from the pistil and each other from top to bottom, or united in some part or other; if they are separate, of the same, or an indeterminate length, and less in number than twenty, then the number alone will suffice to determine the class; and those which have one stamen will belong to the first class entitled *monandria*; those with two stamens to the second, *diandria*; those with three to the third, *triandria*, and so on to the tenth, entitled *decandria*. These are Greek names, and some of them not short ones: since however they are only four-and-twenty in all, you will indulge me so far in time as to have them by heart. The flowers for examination should be gathered as nearly as possible in their natural state; for many of those which are cultivated in gardens, undergo strange transformations, and either lose the stamens and pistils entirely, or acquire an additional number. The first classes, which have but few stamens, are not so liable to change as those which have many. Thus the number in the three classes already mentioned is not variable; nor in the fourth class, *tetrandria*. In the fifth, *pentandria*, some plants have more

than their proper quota of stamens to the flower, at least when cultivated in gardens; but this is a very numerous class, and it is no wonder if we find some few irregular among so many. To secure you in some measure against mistakes on this and other occasions, I must observe, that nature in general, carries a certain proportion through all the parts of the same work; and therefore if you have a flower which has a calyx divided into five segments, and a corol consisting of five petals, or divided into five parts; if you count six or seven stamens, be sure all is not right, and take the pains to inspect some other flowers of the same species, before you determine. I dare affirm such examination will convince you that your flower belongs to the fifth class, *pentandria*, in which the natural number of stamens is five. In the sixth class, *hexandria*, whose beautiful flowers have six stamens, I do not observe so considerable a variation as one might expect in plants that are so much the objects of culture; you will however frequently count more than six stamens in the flowers of the tulip. The flowers of the class *heptandria* should have seven stamens; but you will often find those of the horse-chestnut peccant in this respect. As you will also find some flowers in the three following classes, *octandria*, which has eight, *enneandria* which has nine, and *decandria* which has ten stamens,

mens, as the names all imply. With a little attention however to the proportion of the parts, and by a repetition of your examination where any doubt arises, you will find these ten classes easy to determine.

No flowers being known at present that have constantly and regularly eleven stamens, the eleventh class in the system of Linnæus contains those which have twelve; and is therefore entitled *dodecandria*. But the genera which have this precise number being few; and, as I observed before, the number being uncertain when the stamens are many; all plants are included in this class that have any number of stamens from eleven to nineteen inclusive, provided they are disunited.

All plants that have more separate stamens than these belong to one of the two following classes. Here then you must take in another consideration, besides the number of the stamens, to determine in which of these two classes you are to search for your plant. This consideration is, the *situation* of the stamens; which in the class *icosandria*, is either on the calyx or corol, and in the thirteenth, *polyandria*, on the base or receptacle of the flower. This difference of situation is only to be attended to in those flowers which have many stamens; for you will frequently observe in the fifth class that the monopetalous flowers have the stamens growing out of the corol; but this circumstance

has nothing to do in determining their class. The twelfth class has its name *icosandria*, from the flowers in it having usually twenty stamens or thereabouts, at least in the greater part of the genera: this circumstance however is not to determine the class; but all plants which have many stamens, that is, more than nineteen, fastened either immediately, or mediately by means of the tails of the petals, to the calyx, are to be referred to the class *icosandria*. To assist you farther in distinguishing the flowers of this from those of the following class, it may be remarked that the calyx in this is monophyllous or all of one piece, and concave; and the corol is fixed by its tail or small end into the calyx, instead of the base or bottom of the flower, as it generally is in the other classes.

When on the contrary you find more than nineteen detached stamens in the same flower, with a pistil or pistils, and situated on the base or receptacle of the flower, that plant must belong to the class *polyandria*, signifying many stamens, and the stamens may vary in number from twenty to a thousand in the different genera. These also either have a polyphyllous calyx, that is, consisting of several folioles, generally five, or none at all; though sometimes it falls off, as in the poppy, when the flower opens.

We

We have hitherto supposed you to find all the stamens of the same length, or nearly so; or if not, still we presume that you have not found a certain regular and determinate proportion in their lengths. Now on the contrary we suppose you to take up a flower which has an appearance of regularity in its whole structure; and, that on an attentive examination, you discover four stamens, not all equal in length, but ranged in one row, and the inner pair shorter than the outer one. This plant will probably belong to the fourteenth class, the name of which is *didynamia*, signifying that two of the stamens are stronger than the others. Here you will immediately perceive that you are got among your old acquaintance, for it will strike you that all the flowers which have the character just described are either labiate or personate, and therefore that you was mistress of the class *didynamia*, before you knew that it had this Greek name^b. All then that I need say to you is, that Linnaeus makes the essential character to consist, in the proportional arrangement of four stamens above expressed, accompanied with one pistil, and invested with an irregular monopetalous corol.

There is yet another class of these plants with proportional stamens, which though

^b See letter IV.

you do not know it by the dreadful long name *tetradynamia*, is however one of your first acquaintance under the gentler appellation of cruciform flowers^c. These you remember have four stamens longer than the other two: this is the classical character, and hence its name. For the other distinctive marks by which this class is readily known at first sight, you have them at your fingers ends.

You are now in possession of all those classes which have the stamens free, separate, disunited. If a flower that has both stamens and pistils should present itself, in which you find the stamens united at bottom, it certainly belongs to one of the three next classes: and if on the contrary they are united at top, that is, the anthers form one body, it will belong to the nineteenth class.

In the sixteenth class called *monadelphia*, the filaments are united so as to form one regular membrane at bottom, whilst they are distinct at top. Of this character you have a clear and convincing instance, in that very common plant the mallow. In some others however of this class the character is not so evident, and without a careful inspection of the flowers to the very bottom, you might easily be tempted to give them to ano-

^c See letter II.

ther class. Observe then farther, that the flower has always a calyx, and frequently a double one: that the corol consists of five heart-shaped petals: that the receptacle of the fruit, as it is called, or the column to which the seeds are fastened, projects above them in the centre of the flower: that the germs surround this in a ring: that all the styles are united at bottom and form one body with the receptacle, but are divided at top into as many threads as there are germs: and that these germs grow into a kind of capsule divided into as many cells as there are pistils, or consisting of the same number of arils, which are loose coats covering each seed separately, and not easily falling from it.

In the seventeenth class, *diadelphia*, the filaments are united at bottom; not however into one, but two bodies. These flowers also have but one pistil; the fruit is a *legume* or pod; and if I add that the flowers are papilionaceous, you will immediately discover that this is another class with which you are perfectly acquainted, and with the form of whose flowers you was so much delighted^d.

In the eighteenth class the filaments are united in three or more bundles, and the name of it is *polyadelphia*. The union being

^d See letter III.

generally at the bottom only, without extending up the filaments, and the flowers having no distinguishing character, you must pull out the stamens, in order to be certain that the plant belongs to this class. The names of the three last-mentioned classes signify literally one, two, and three brotherhoods.

If instead of the filaments being joined at bottom, they are free and distinct, but the anthers are connected together, so as to form one body, then your plant will be found in the class *syngenesia*. But the flowers in this class being small, and the above-mentioned circumstance not being the first that will strike an examiner of flowers, it must be added that they are *compound*; and this one word is sufficient to overcome the whole difficulty with you who know these flowers at first sight, and have so frequently dissected the florets and semi-florets which compose them^c.

Though in the four last classes the stamens have been in some sort united; yet both in these, and in all the former, they have been found detached from the pistil, so at least as that the one may be taken off from the plant without the other. But what if a flower should occur to you in which you

^c See Letter VII. *Syngenesia* signifies *congeneration*, or union of the anthers.

are unable to do this, but you find on the contrary that the stamens grow upon the pistil itself? Then, I answer, it belongs to a class entitled *gynandria*, which is the twentieth in the system of Linnæus, and derives its name from this peculiar circumstance, by which it stands insulated as it were, and detached from all the others. From the singular position of the pistils in this class, arises a singularity in the appearance and shape of the flowers in most of the genera; and sometimes the receptacle is lengthened out in form of a style, and bears both stamens and pistils upon it.

Hitherto you have been concerned with such plants only as have flowers which I call complete or perfect, because they have both stamens and pistils. But a plant perhaps may have occurred to your observation, in which you have found these parts always in separate, distinct flowers. In this case I beg leave to coin two words, and to call those which have the stamens only *staminiferous*, and those which have the pistils only *pistilliferous* flowers. Now when you find these, and these only on the same tree or plant, that tree or plant belongs to the twenty-first class in the arrangement of Linnæus, called by him *monoecia*, a term signifying one house: the flowers of different kinds being produced in the same habitation, or on the same individual plant. Whereas in
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the following class, these staminiferous and pistilliferous flowers are not merely separate from each other, but are always found on distinct plants of the same species, and in other respects so alike, as not to be distinguished when they are out of flower. The name of this class therefore is *dioecia*, signifying two houses, and implying that incomplete flowers only are found in different habitations, or on separate trees or plants, never on the same.

There remains now only one possible case to provide for, in the arrangement of conspicuous flowers, which is this. Suppose you find some flowers that are complete; and at the same time others which bear only stamens or pistils, on the same plant with the complete flowers, or on different plants of the same species. There is a class, namely, the twenty-third, provided for the reception of such plants, and it is entitled *polygamia*, from this variety in the flowers.

For plants with inconspicuous flowers, as being of less consideration, there is only one class provided; and that is called *cryptogamia*, from the circumstance of the fructification being concealed, or not obvious to our eyes. For the flowers in the most perfect of these are hardly to be distinguished without a glass, and in many not even with it; nay, the most acute observers have not detected flowers in them all, though in all probability

probability there is no vegetable without them. They will be easily known from plants with conspicuous flowers, by their singular structure; as you will readily acknowledge when I inform you that the objects of this, the lowest class of vegetables, are ferns, mosses, sea-weeds, and funguses: and therefore when we talk of inconspicuous flowers, we do not mean to include such as are destitute of a magnificent corol, but such only as have not the stamens and pistils visible to the naked eye. But you are too good an observer to require such admonitions. By this time you are doubtless sufficiently fatigued, as well as myself, with all this dry matter; and what is worse, you have not learnt to find out one plant: but patience; we are in the way, and have made great progress, though we are not arrived at the end of our journey. We will soon make another long stage, unless you tell me you have enough, and in that case I promise to trouble you no more with this trash; for if it does not amuse and even interest you, throw it at once into the fire.

L E T T E R X.

May the 1st, 1774.

PRESUMING, dear cousin, that you have already examined abundance of spring flowers, and determined their classes, upon the instructions contained in my last letter, I shall proceed in this to give you the characters of the orders, or divisions of the classes. If you were to proceed at once to the examination of the species, all would be confusion; just as if you attempted to estimate a vast mixt multitude, fluctuating in tumultuary disorder: but if you have patience to make a regular progress; to throw this multitude into large bodies, to subdivide these into smaller ones, and these again into others so small as to command them well with the eye, you have at length a regular army, which you can number, arrange, and discipline at your pleasure. We will now divide our twenty-four regiments into their respective companies. Here I think you will not find so much difficulty as in the classes: for the orders in the first thirteen classes are founded wholly upon the *number* of the pistils, so that the chief of your task here will be to learn so many new terms, which are formed by putting *gynia* instead of *anaria*
to

to the Greek words signifying the numbers: as *monogynia*, one pistil; *digynia*, two pistils; and so on.

After the first thirteen classes we no longer use the pistils for the purpose of subdividing the classes into orders. In the class *didynamia* it would be nugatory, because you have observed that all the flowers of the ringent tribe have one pistil, and no more. Here then we have recourse to another circumstance which answers extremely well. For we find that most of the plants which have a labiate flower have four naked seeds at the bottom of the calyx; and that the personate flowers are succeeded by a capsule containing many small seeds: hence arises an elegant, commodious, obvious, and natural division of the fourteenth class into two orders, *gymnospermia* and *angiospermia*; the first containing all the ringent flowers with four naked seeds ripening in the calyx: the second such as have the seeds contained in a bilocular pericarp, or seed-vessel of two cells, and fastened to a receptacle in the middle of it.

In the next class, *tetradynamia*, the flowers have also one pistil and no more. Here again it is found convenient to take the fruit for the subdivision of it into orders. These are called *filiculosa* and *siliquosa*, from the form of the fruit, which we call *silicle* and *siliqua*; having only the word *pod* current in our language, which will not suffice to distinguish these

from each other, nor from the pod in the leguminous tribe. The plants of the first order then have a *filicle* or short roundish pericarp; those of the second a *silique* or oblong narrow pericarp: both are bilocular; but the structure has been already sufficiently explained^f.

In the 16th, 17th, and 18th classes it is found best to take the orders from the number of stamens. Here then is no sort of difficulty; and, what is very pleasant, you have no new terms to burden the memory.

The chief difficulty, with respect to the orders, lies in the class *syngenesia*. Tournefort's division of the compound flowers into *flosculous*, *semi-flosculous*, and *radiate* was pretty and obvious; but Linnæus's is abstruse and difficult. I will explain it to you however as clearly as I can. You are perfect mistress of a compound flower, and the different sorts of florets of which it is composed^g. I must next inform you, therefore, that what you know by the name of compound, is called by Linnæus a *flosculous* flower; and that he calls the florets, *tubulous* floscules, and the semi-florets, *ligulate* floscules; this being premised we may use the language of Linnæus or Tournefort as we please. Now if you examine these floscules nicely, you will disco-

^f See letter II.

^g See letter VI.

ver that they have sometimes both stamens and pistil; but you will see that others have stamens only; others again a pistil only: and lastly, some have neither stamens nor pistil. The first of these I call *perfect*^h floscules; the second *staminiferous*, the third *pistiliferous*, and the fourth *neuter* floscules. All these variations are to be found both in the tubulous and ligulate floscules; and must be well attended to, because on these variations, assisted by the form of the florets, Linnæus has founded the four first orders of this class.

Polygamia æqualis is the name of the first order. *Polygamia* is the family name, which this has in common with all the orders except the last; it is used only in opposition to *monogamia*, and implies that there are many florets inclosed within one common calyx; which is your idea of a compound flower. The peculiar name *æqualis* signifies equal, regular, or alike, and implies that the whole flower is regular, and that all the component floscules therefore, whether tubulous or ligulate, are alike; and indeed they are not only so, but likewise perfect, or all furnished with stamens and pistil; and therefore each followed by a seed. If these flowers have any ligulate floscules, all the rest are so; if any tubulous floscules, all the rest are so likewise, except in one genus, which has radiate flowers.

* Perfect at least in appearance, if not always really so.

In the second order, *polygamia superflua*, all the florets of the disk, centre or middle of the flower are perfect; those of the ray or exterior part pistilliferous: both of them produce seed. Most of the flowers in this order are *radiate*, and then they are easily known by the circumstance of having fertile seeds both in the disk and ray: but there are some which have tubulous florets only, and appear like the disk of a radiate flower, as a daisy would look when spoiled of its white semi-florets; whence Ray called them *discoid* flowers: in these however, on an attentive inspection, you will discover that some of the outer ones are deficient in stamens at least, if not in corol too. These are by much the largest orders, each of them containing almost double the number of genera, that are in the three remaining orders of compound flowers taken together.

The third order of these compound flowers, or of the class *syngenesia*, is entitled *frustranea*. The character of the order is, that the florets in the disk or centre are perfect, and produce seed; whilst those of the ray are imperfect, and therefore abortive or frustrate, whence the name. This is a very small order, containing only eight genera; of which seven have radiate flowers, and the eighth, which however is a numerous one, has capitulate flowers like the thistles, but differing from them in having either neuter or abortive florets

florets next the calyx, as in the common blue-bottle; in which the neuter floscules distinguish themselves by being much larger than the others; but on examination they are mere corol, and nothing else.

In the fourth order, *neceffaria*, the florets in the disk or middle are apparently perfect, but are not really so, and therefore produce no perfect seed; whilst the pistilliferous floscules in the ray or outside of the flower are fertile. All these have radiate flowers, except in two genera, wherein the exterior fertile florets have scarcely any corol.

In the fifth order, *polygamia segregata*, there is a common calyx, as in the foregoing orders; but besides that there is in this order a partial one, including one or more florets, which are thus separated from each other in a manner different from the rest of the orders: and hence the name. By this order the compound approach the aggregate flowers; such as the teasel, scabious, &c. but then these have not the character of the class syngenesia in the union of the anthers.

The sixth or last order is entitled simply *monogamia*, because it consists of plants with *simple*, not compound flowers, which circumstance is abundantly sufficient to discriminate this order, provided you attend at the same time to the classical character.

We

We have now, dear cousin, happily, I hope, passed *the fool's bridge*, and are arrived safely on the other side, where the way is plain, and we shall soon get pleasantly to the end of our stage. In short, the orders of the three following classes, *gynandria*, *monoecia*, and *dioecia*, being founded upon the stamens, and taking their names from the foregoing classes, according to the number, and union or disunion of the stamens in the respective flowers; there is nothing new to be learnt in any of these.

The twenty-third class indeed, *polygamia*, has three orders, arising from the triple mode in which the three sorts of flowers may be arranged; either on the same plant, on two distinct plants, or on three. When the perfect and imperfect flowers are on the same plant, the order is entitled *monoecia*. When the perfect flowers are on one plant, and the imperfect ones on a second of the same species, the order is then entitled *dioecia*. And when the perfect flowers are on one plant; stamiferous ones on a second, and pistilliferous ones on a third, all of the same species; then such plant belongs to an order called *trioecia*, signifying three houses; the three sorts of flowers having three distinct habitations.

The last class having no flowers whose parts are discernible by the naked eye; and therefore called *cryptogamia*: having also many

many genera in which we are uncertain what the fructification is; many in which we can discern no fructification at all: the characters of the orders can no longer be taken from the stamens and pistils. Fortunately the plants of this class have a very particular structure, serving very well both to ascertain the classical character, and the division of it into four Orders; which are called I. Filices, or Ferns. II. Musci, or Mosses. III. *Algæ*, or Sea-weeds; and, IV. *Fungi*, or Funguses.

The *ferns* mostly have their fructification upon the backs of their leaves. This, when examined by the microscope, appears to consist of a scale arising from the leaf, and opening on one side; and under that, some little balls on pedicles, surrounded by an elastic ring: in due time the balls burst, and throw out a fine dust, which is supposed to be the seed. Linnæus makes the scale to be a calyx: and the globules are probably so many capsules or pericarps.

The *mosses* have small threads growing out of the bosoms of the leaves, terminated by a small body, the whole resembling stamens: accompanied by little shorter threads supposed to be pistils, sometimes on the same plant with the former, and sometimes on another. The first of these Linnæus took for anthers, and actually called them so; but he suspected them afterwards to be capsules,

fules, and such they turn out to be, by a narrower inspection with greater magnifiers.

Of the *algæ* we know too little about the fructification to give a regular character of the order, which includes not only the sea-weeds, but the liverworts, &c. these have been ranged by others among the mosses. In the latter there are little bodies visible enough, which are taken for staminiferous and pistilliferous flowers, distinct from each other; but experiments are yet wanting to ascertain them with precision. On the former are little bladders, some hollow with hairs within, others filled with a gelly-like substance; and these are supposed to be the flowers and fruits.

If the *funguses* have any fructification it is imagined to be underneath, in the gills, pores, &c. But I will not detain you with these dregs of vegetable nature, in which you will take no pleasure till you have imbibed an enthusiastic passion for Botany.

After the class *cryptogamia* Linnæus has given the *palms*, in a twenty-fifth class, or appendix, without any character. I presume he has thus thrown them into the rear of his system, partly because he could not have ranged this proud set of trees according to his laws, without tearing them from each other; and partly because they have not been examined with sufficient accuracy; you will
scarcely

scarcely have an opportunity of examining this natural class, the most remarkable characters of which are, that the staminiferous flowers are distinct from the pistilliferous, on the same or different individuals; except in one genus, which has complete or perfect flowers accompanied by staminiferous ones on the same individual; all proceeding from a *spathe* or sheath, and growing upon a *spadix*ⁱ. So that these trees belong to the three last classes of conspicuous flowers in the artificial system.

Thus, dear cousin, we have accomplished our second stage. And this letter not being of so unconscionable a length as the former, I have accompanied it with two tables; one of the classical characters, and another explaining those of the orders: that after reading my diffusive explanation, you may have the whole under your eye at once; and thus perhaps at one view form a better idea of the arrangement of vegetables into classes and orders, than you could do from many de-

ⁱ The *spadix* is the receptacle in this tribe, and has no English name. In another place, Linnæus, in distributing vegetables into nine nations, assigns the first to the palms, calling them Princes of India, bearing their fructification on a *spadix*, within a *spathe*; flowing; remarkable for their prodigious height; distinguished by an unvaried, undivided, perennial trunk; crowned at top by an evergreen bush of leaves; rich in abundance of large, fine fruit.

tached pages^k. We are not yet arrived at specific or individual information, but we are on the borders, as I shall convince you in my next letter. In the mean time you have sufficient employment for your eyes and attention, without doors as well as within: for if you had taken up this trash of mine only in your dressing room, you would long since have thrown it into the fire; if it meets with a better fate, I owe it merely to the beautiful objects which your fair hands have cropt in the garden and fields. Always give the preference to the latter where you can, both for the sake of exercise, and having your plants in their natural state. Adieu, dear cousin; continue your kind indulgence to my prate.

^k See Curtis's beautiful explanation of Linnæus's System of Botany, with coloured plates. And an Illustration of the System of Linnæus, by John Miller; who has given a plate of one genus in every class and order. Lond. 1779, octavo.

The Outlines of LINNÆUS's System of Vegetables.

[To face page 108.]

A. Plants with conspicuous Flowers.

B. 1. All complete, or furnished with Stamen and Pistil.

C. With Stamens separate from the Pistil.

D. And separate from each other.

E. All of the same length, or not proportionably longer than each other.

F. In which the number only is to be considered.

I. MONANDRIA. One Stamen.

II. DIANDRIA. Two Stamens.

III. TRIANDRIA. Three Stamens.

IV. TETRANDRIA. Four equal Stamens.

V. PENTANDRIA. Five Stamens.

VI. HEXANDRIA. Six equal Stamens.

VII. HEPTANDRIA. Seven Stamens.

VIII. OCTANDRIA. Eight Stamens.

IX. ENNEANDRIA. Nine Stamens.

X. DECANDRIA. Ten Stamens.

XI. DODECANDRIA. From 11 to 19 Stamens inclusive.

F. In which the situation is also to be considered.

XII. ICOSANDRIA. About 20 Stamens on the Calyx or Corol.

XIII. POLYANDRIA. Twenty Stamens or more on the receptacle or base of the Flower.

E. Some Stamens proportionably longer than others.

XIV. DIDYNAMIA. Four Stamens, two longer. One Pistil. Flowers ringent.

XV. TETRADYNAMIA. Six Stamens, four longer. One Pistil. Flowers cruciform.

D. Stamens coherent at bottom only, or by the Filaments.

XVI. MONADELPHIA. Filaments united into one body.

XVII. DIADELPHIA. Filaments in two bodies. Corol papilionaceous.

XVIII. POLYADELPHIA. Filaments in 3 or more parcels.

D. Stamens coherent at top only, or by the Anthers.

XIX. SYNGENESIA. Anthers united, 5 Filam. distinct, 1 Pistil, Flowers compound.

C. With Stamens growing out of the Pistil itself.

XX. GYNANDRIA. Stamens on the Pistil instead of the Receptacle.

B. 2. All incomplete; or which have Stamens only, or Pistils only.

XXI. MONOECIA. Each sort of Flower separate, but on the same Plant.

XXII. DIOECIA. Each sort of Flower, on distinct Plants only.

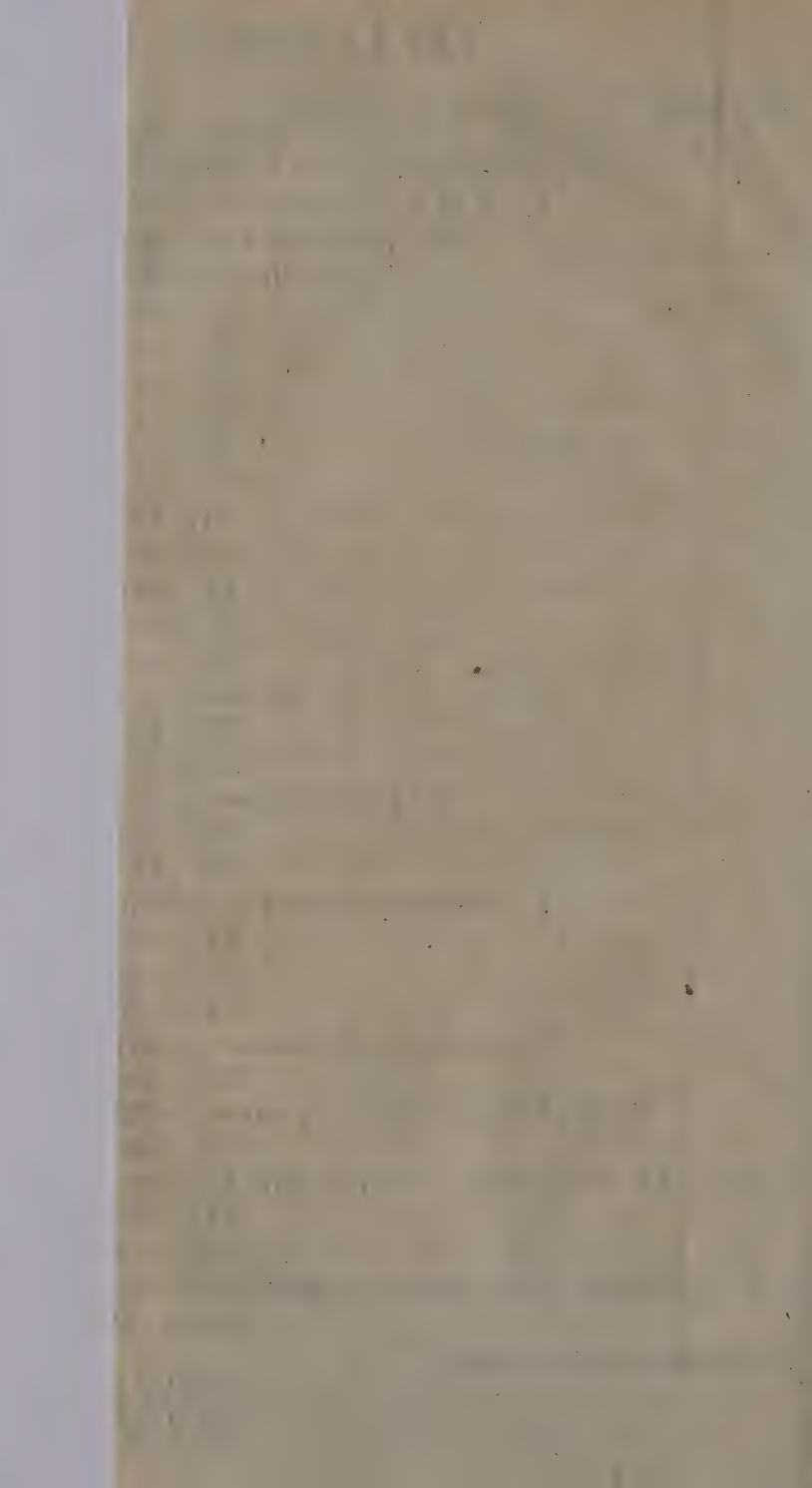
B. 3. Flowers of the first sort, together with one or both of the second sort.

XXIII. POLYGAMIA.

A. Flowers inconspicuous.

XXIV. CRYPTOGAMIA. Flowers very small, invisible, or not yet discovered.

XXV. PALMS. Flowers born on a *Spadix*, and within a *Spathe*, mostly incomplete.



Sketch and Explanation of the Orders in the System of Linnæus.

- I. Monandria. *One stamen.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
- II. Diandria. *Two stamens.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
 - 3. Trigynia. *Three pistils.*
- III. Triandria. *Three stamens.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
 - 3. Trigynia. *Three pistils.*
- IV. Tetrandria. *Four equal stamens.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
 - 3. Tetragynia. *Four pistils.*
- V. Pentandria. *Five stamens.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
 - 3. Trigynia. *Three pistils.*
 - 4. Tetragynia. *Four pistils.*
 - 5. Pentagynia. *Five pistils.*
 - 6. Polygynia. *Many pistils.*
- VI. Hexandria. *Six equal stamens.*
 - 1. Monogynia. *One pistil.*
 - 2. Digynia. *Two pistils.*
 - 3. Trigynia. *Three pistils.*
 - 4. Tetragynia.

4. Tetragynia. *Four pistils.*
5. Polygynia. *Many pistils.*
- VII. Heptandria. *Seven stamens.*
 1. Monogynia. *One pistil.*
 2. Digynia. *Two pistils.*
 3. Tetragynia. *Four pistils,*
 4. Heptagynia. *Seven pistils.*
- VIII. Octandria. *Eight stamens.*
 1. Monogynia. *One pistil.*
 2. Digynia. *Two pistils.*
 3. Trigynia. *Three pistils.*
 4. Tetragynia. *Four pistils.*
- IX. Enneandria. *Nine stamens.*
 1. Monogynia. *One pistil.*
 2. Trigynia. *Three pistils.*
 3. Hexagynia. *Six pistils.*
- X. Decandria. *Ten stamens.*
 1. Monogynia. *One pistil.*
 2. Digynia. *Two pistils.*
 3. Trigynia. *Three pistils.*
 4. Tetragynia. *Four pistils.*
 5. Pentagynia. *Five pistils.*
 6. Decagynia. *Ten pistils.*
- XI. Dodecandria. *Twelve stamens, (from 11 to 19.)*
 1. Monogynia. *One pistil.*
 2. Digynia. *Two pistils.*
 3. Trigynia. *Three pistils.*
 4. Pentagynia. *Five pistils.*
 5. Dodecagynia. *Twelve pistils.*
- XII. Icosandria. *Twenty stamens, (on the calyx or corol.)*
 1. Monogynia.

1. Monogynia. *One pistil.*
2. Digynia. *Two pistils.*
3. Trigynia. *Three pistils.*
4. Pentagynia. *Five pistils.*
5. Polygynia. *Many pistils.*

XIII. Polyandria. *Many stamens, (from 20 to 1000, on the receptacle.)*

1. Monogynia. *One pistil.*
2. Digynia. *Two pistils.*
3. Trigynia. *Three pistils.*
4. Tetragynia. *Four pistils.*
5. Pentagynia. *Five pistils.*
6. Hexagynia. *Six pistils.*
7. Polygynia. *Many pistils.*

XIV. Didynamia. *Four stamens, 2 longer and 2 shorter.*

1. Gymnospermia. *Four naked seeds.*
2. Angiospermia. *Seeds inclosed in a pericarp.*

XV. Tetradynamia. *Six stamens, 4 longer and 2 shorter.*

1. Siliculosa. *Pericarp generally roundish, with the style persistent or continuing, called a filicle.*
2. Siliquosa. *Pericarp very long and narrow, called a filique or pod.*

XVI. Monadelphia. *One brotherhood ; or filaments all connected.*

1. Triandria. *Three stamens.*
2. Pentandria. *Five stamens.*
3. Octandria. *Eight stamens.*
4. Decandria. *Ten stamens.*
5. Endecandria.

5. Endecandria. *Eleven stamens.*
6. Dodecandria. *Twelve stamens.*
7. Polyandria. *Many stamens.*
- XVII. Diadelphia. *Two brotherhoods : or filaments in two bodies.*
 1. Pentandria. *Five stamens.*
 2. Hexandria. *Six stamens.*
 3. Octandria. *Eight stamens.*
 4. Decandria. *Ten stamens.*
- XVIII. Polyadelphia. *Many brotherhoods : filaments in three or more parcels.*
 1. Pentandria. *Five stamens.*
 2. Dodecandria. *Twelve stamens.*
 3. Icosandria. *Twenty stamens.*
 4. Polyandria. *Many stamens.*
- XIX. Syngenesia. *Congeneration. Anthers united.*
 1. Polygamia *Æqualis.* *All the floscules perfect, and the whole flower regular.*
 2. Polygamia *superflua.* *Perfect floscules in the disk : pistilliferous floscules in the ray : both producing seed.*
 3. Polygamia *Frustranea.* *Floscules in the disk perfect, and producing seed : in the ray imperfect, and without seed.*
 4. Polygamia *Necessaria.* *Floscules in appearance perfect in the disk, producing no seed : pistilliferous floscules in the ray producing seed.*
 5. Polygamia *Segregata.* *Many floriferous calyxes contained in one common calyx, and forming one flower.*
 6. Monogamia. *Flowers not compound,*

as in the other orders, but simple, as in all the other classes.

XX. Gynandria. *Stamens growing on the pistil.*

1. Diandria. *Two stamens.*
2. Triandria. *Three stamens.*
3. Tetrandria. *Four stamens.*
4. Pentandria. *Five stamens.*
5. Hexandria. *Six stamens.*
6. Octandria. *Eight stamens.*
7. Decandria. *Ten stamens.*
8. Dodecandria. *Twelve stamens.*
9. Polyandria. *Many stamens.*

XXI. Monoecia. *One house. Imperfect flowers separate on the same plant.*

1. Monandria. *One stamen.*
2. Diandria. *Two stamens.*
3. Triandria. *Three stamens.*
4. Tetrandria. *Four stamens.*
5. Pentandria. *Five stamens.*
6. Hexandria. *Six stamens.*
7. Heptandria. *Seven stamens.*
8. Polyandria. *Many stamens.*
9. Monadelphia. *Filaments united in one.*
10. Syngenesia. *Anthers united.*
- 11 Gynandria. *Stamens on the pistil.*

XXII. Dioecia. *Two houses. Imperfect flowers on distinct individuals.*

1. Monandria. *One stamen.*
2. Diandria. *Two stamens.*
3. Triandria. *Three stamens.*
4. Tetrandria. *Four stamens.*
5. Pentandria. *Five stamens.*
- I 6. Hexandria.

6. Hexandria. *Six stamens.*
 7. Octandria. *Eight stamens.*
 8. Enneandria. *Nine stamens.*
 9. Decandria. *Ten stamens.*
 10. Dodecandria. *Twelve stamens.*
 11. Polyandria. *Many stamens.*
 12. Monadelphia. *Filaments united in one.*
 13. Syngenesia. *Anthems united.*
 14. Gynandria. *Stamens on the pistil.*
- XXIII. Polygamia. *Perfect flowers, accompanied with one or both sorts of imperfect flowers.*
1. Monoecia. *Perfect and imperfect flowers on the same plant.*
 2. Dioecia. *Perfect flowers on one plant, and imperfect on another.*
 3. Trioecia. *Perfect flowers on one plant, stamiferous flowers on a second, and pistilliferous flowers on a third.*
- XXIV. Cryptogamia. *Fructification secret.*
1. Filices. *Ferns: bearing seed on the back of the leaves.*
 2. Musci. *Mosses: having imperfect flowers distinct, and the seeds in a capsule, often covered with a veil.*
 3. Algæ. *Having imperfect flowers distinct, and the seeds either like a meal on the leaves or inclosed in bladders.*
 4. Fungi. *Having no discernible flowers, but seeds in the gills, pores, cups, &c.*
- XXV. Palmæ: *Palms. Flowers on a spadix, in a spathe or sheath: generally stamiferous and pistilliferous distinct.*

LETTER XI.

June the 10th, 1774.

AT length, dear cousin, I am going to put you in the way of examining plants by yourself, and determining the genus and species, as you have before done the class and order. You have been already initiated in my first letters; but now I shall proceed in more form, and present you with one plant or more of each class; explaining to you as we go along some others of the natural classes; which form, or are contained in the artificial ones.

The first class, *Monandria*, in the System of Linnæus is a very small one; comprising, as you have seen already, in the second table which I sent you, but two orders. There are also but eighteen *genera* in it, and forty-four species. Very few of these plants are natives of Europe; and the Indian sorts are not easy to be met with, at least in flower, in the best hot-houses.

There is a plant however not very uncommon in ponds, ditches, and slow muddy streams, called *Hippuris*, which is of this class, and of the first order. It has a single jointed stalk, and at each joint is a dozen leaves or more, placed all round in a whorl, which is a form that Linnæus calls *Verticil-*

late. To each of these leaves, close to the stalk, belongs a little flower, consisting of a single stamen and pistil, one seed, and nothing more; for it has neither calyx nor corol. You will find the stamen sitting on the germ terminated by a bifid anther; and behind this is the style which is very short, and terminated by a stigma tapering to a point. This will be amply sufficient for you to determine the *Hippuris*^a, which perhaps may not grow near you; and if it does, you must not hazard wetting and dirtying yourself in a muddy ditch. Since therefore it is abundant in the moat of the neighbouring abbey, I have inclosed some specimens of it in my tin pocket case, which may serve afterwards to bring home your plants fresh and cool, if you are not already provided with so necessary a thing. If you are not struck with the beauty of the *Hippuris*, you will at least esteem it for its modesty and simplicity. I have one favour to ask in return for my tin box and its contents, which is, that whenever you call this plant by its name, you will pronounce the middle syllable long, and not short, as many do: for I am solicitous to

^a I do not know that this plant has been noticed enough to have a common name in English. In the books it is called *Female Horse-tail* or *Mare's Tail*. Figured in Curtis, *Flora Londinensis*. Fascic. IV. Plate I.

pronounce,

pronounce, as well as think, like you. I have said nothing here of the distinction between genus and species, because there is only one sort of *Hippuris*. I must however inform you, once for all, that we invariably take the characters of the genera from the parts of fructification; and those of the species from the other parts of the plant, particularly the leaves.

There is another plant of this class and order, which your gardener may possibly have in the hot-house. I dare say you know it by the upright growth, reedy appearance, and fine scarlet flowers. Perhaps you have already found some difficulty in determining the class and order; for there is no filament but the anther grows to the edge of a kind of petal, which Linnæus calls the *Nectary*: the style also, which is lance-shaped, grows to the same petal. The calyx consists of three leaves: the corol is cut into six parts, five erect, and the sixth reflexed; the seeds are contained in a capsule or vessel of three cells, are round and very hard; whence this plant has the name of *Indian shot*. Linnæus calls it *Canna*. Thus much for the *Genus*, of which there are three species at least; some make five. Linnæus has distinguished his three species thus. 1^a. *Canna indica*; by its ovate leaves, sharp-pointed towards both ends, and marked with

^a This is figured by John Miller, in his *Illustrations of the Sexual System*.

nerves. 2. *C. angustifolia*, *Narrow-leaved Indian shot*, by its lance-shaped, petiolate leaves, marked also with nerves. 3. *C. glauca*, *Sea-green Indian shot*, by its lance-shaped petiolate leaves, smooth or without nerves. Yours will be one of the two first species, for the last has yellow flowers. This order contains several interesting plants, such as ginger, cardamom, grain of paradise, Arabian costus, turmeric, galangale, &c. all which, with *Canna*, belong to a natural tribe entitled *Scitamineæ*, from the Latin word *scitum*, which when tacked to *edulium* implies eatables of a pleasant taste. They have not only the same place in the artificial system, but they agree farther in having their seeds enclosed in a vessel below the receptacle, as you perceive plainly it is in the *canna*: the divisions also of the calyx, corol, and seed vessel, are usually three.

Short flights are best, till you have tried your wings. My next may possibly be a little longer, if you give me leave. Adieu for a few days.

LETTER XII.

June 17th, 1774.

YOU have starved a week, dear cousin, upon the meagre fare of my last: I can now promise you more variety, having a larger range and better choice. The second class of plants, *diandria*, has 35 genera, and 265 species.

Linnæus has done every thing in his power to facilitate the investigation of plants; and nothing contributes more to this than the clearness and order of his arrangement, and his leading on the student by regular steps from generals to particulars. Thus, after you have settled the class and order of your plant, you perceive that each order, when numerous, is thrown into several great divisions, before you are presented with the generic characters. This shortens your inquiry considerably; for, in the first order of this class, instead of having the characters of thirty-five genera to choose out of you have by this means only eight or nine, or perhaps no more than three, or even one. That you may understand this the better I will give you Linnæus's subdivision of the first order of this class.

DIANDRIA MONOGYNIA.

1. Flowers inferior, monopetalous, regular:
8 genera.
2. ——— inferior, monopetalous, irregular,
with seeds inclosed in a vessel: 9
genera.
3. ——— inferior, monopetalous, irregular,
with naked seeds: 9 genera.
4. ——— inferior, pentapetalous: 1 genus.
5. ——— superior: 3 genera.

So that if your plant happens to belong to the fourth division, it is determined at once: and in all the rest your search is much facilitated^b.

In this class, though by no means one of the most numerous, you will not be at a loss, either in your garden or in the fields, for examples.

You are well acquainted with most sorts of jasmine. Take any one of them, and you will perceive immediately that it belongs to the first division of the first order. Compare as many of the species as you can meet with in flower, and you will find that they all agree in the characters of it.

But other circumstances are to be found in them all, called *generic characters*: these in

^b It is not necessary to be more particular with the English reader, since the botanical society at Lichfield have published a translation of Linnæus's System of Vegetables.

the present case are: that the corol is monopetalous, falver-shaped^c, and the border divided into five segments: the anthers small, and lying within the tube of the corol: the seed-vessel a berry of two cells: and the seeds covered with an *aril* or loose coat.

Having seen in what all the Jasmynes agree, to determine the class, order, with its divisions, and genus; now attend to the circumstances in which they differ, to settle the six species. For this the leaves will nearly suffice, thus:

1. Leaves pinnate, opposite: lobes distinct.
Jasmine officinal.
2. Leaves pinnate, opposite: lobes confluent.
J. Catalanian.
3. Leaves ternate, opposite. *J. Azorian.*
4. Leaves ternate and simple, alternate:
branches angulate: *J. shrubby.*
5. Leaves ternate and pinnate, alternate,
acute: branches angulate. *J. dwarf.*
6. Leaves ternate and pinnate, alternate,
obtuse: branches round. *J. sweet-scented.*

The three first have the corol white; in

^c If the reader be at a loss for the meaning of terms, there is no want of books to consult; such as Lee's and Rose's Introductions, Berkenhout's Dictionary, Milne's Institutes, &c.

the three last it is yellow. If you inquire after your favourite *Arabian jasmine*, it belongs to another genus, *Nyctanthes*, because it has the calyx and corol divided into eight segments. The *Cape jasmine* is of another class, the fifth; and of course has another name, *Gardenia*.

Several other trees and shrubs belong to this same first division. *Privet*, *Phillyrea*, *Olive*, and the *Lilacs*. These have all a quadrifid corol; and are distinguished by their fruit, which in privet is a *berry* with four seeds; in phillyrea a *berry* with one seed; in olive a *drupe*; in the lilacs a bilocular *capsule*. The common lilac has heart-shaped leaves; a circumstance sufficient to distinguish it from the Persian, which has lance-shaped leaves. As to the different colours of the flowers in the first—white, blue, and red, they form but varieties: colour being rarely permanent enough to constitute specific differences.

In the second division is a genus, named from a female saint, *Veronica*: it is a very numerous one, containing no less than forty species. Here therefore Linnæus has done with the genus, as he did before with the order—he has thrown it into three principal divisions from the manner of flowering.

1. Such as bear the flowers in spikes.
2. Such as bear them in racemes or bunches.
3. Such as produce them singly.

This

This genus is easily known by the monopetalous, rotate, or wheel-shaped corol, divided into four segments, the lowest of which is narrower than the rest; and the bilocular, heart-shaped, flattened capsule.

One species is very common among bushes, and in the edges of pastures. Its beautiful blue flowers have doubtless attracted your notice, and in falling off too easily, have given occasion perhaps to many a lesson on the short duration of our enjoyments, or the fleeting nature of female charms, to your lovely daughter. If it be not already past flowering, for May is its season, you will find that it belongs to the second division; or even if it be, the oval, wrinkled leaves, indented about the edge, and sitting close to the stalk, together with the weak trailing stems, unless upheld by the bushes, will so clearly point out this humble plant to you, that you cannot well be mistaken ^d.

If this species however is out of blow, you will certainly find another ^e in dry pastures or heaths, especially upon old ant-hills: it may perhaps have escaped you; the flowers being small, and of a pale colour; not however without their beauty, on a nearer survey. This belongs to the first division; having

^d Veronica Chamædrys. Wild Speedwell or Germander. Curtis, Lond. I. 2.

^e Veronica officinalis. Officinal Speedwell. Curtis, Lond. III. 1.

the flowers growing in spikes, coming out chiefly from the side of the plant, at some distance from the main stem; the leaves are opposite, and the stalks trail along the ground. It has the trivial name of officinal, because an infusion of it is sometimes used medicinally.

Other species are common by the sides of ditches and brooks, whence they have the name of *Water Speedwell*, or *Brooklime*^f: these are of the second division: and three species of the third division are abundant among corn, in the spring^g.

I know not how it is, but there is a connexion between this class and the fourteenth. *Pinguicula* or *Butterwort* has a personate flower. Some species of *Vervain* have two stamens, others four of unequal lengths; among the latter is our common or officinal *Vervain*^h; whence some authors have removed it to the class *didynamia*. *Sage*, *Rosemary*, and others, have labiate flowers, and in every respect so resemble the plants of the fourteenth class, that they should naturally be placed there; but having only two stamens, the artificial system ranges them in this class. *Sage* seems to form the con-

^f *Veronica Becabunga*. Curtis, Lond. II. 3. is one of these.

^g *Veronica arvensis* Curtis, Lond. II. 2. *agrestis*. Curtis, Lond. I. 1. *hederifolia*. Curtis, Lond. II. 1.

^h Curtis, Lond. I. 41.

necting link between the two classes; for in this genus are rudiments of another pair of stamens, but without anthers. The structure of the stamens in the sage is singular, and merits your observation. The two filaments are very short, but two others are fastened to these transversely by the middle; and at one end of these last is a gland, at the other an anther. This circumstance distinguishes the genus from all others, and is called its essential character. If you compare the flowers of sage and rosemary together, you will find them agree in most other particulars; but rosemary has not this character: it has very long filaments, bending towards the calque or upper lip of the corol.

The genus *Salvia* or *Sage* has no less than fifty-two species. Our common garden sageⁱ, of which there are several varieties, has the flowers growing in spikes, the segments of the calyx acute, and the leaves of an oblong ovate form, entire, and very slightly notched about the edges. There are two sorts commonly wild in Europe^k, not very unlike each other; but rather *clarys* than *sages*: You will be at no loss to know them when you see them. To distinguish them from

ⁱ *Salvia officinalis* *Linnaei*.

^k *Salvia pratensis* & *verbenaca*; but the latter only is common in England.

each

each other observe that *Meadow Clary*ⁱ has the leaves oblong-heart-shaped, and notched about the edges; the upper ones embracing the stalks; the flowers grow in almost naked whorls, and the upper lip of the corol is glutinous. The *Wild Clary*^m has the leaves serrate, sinuate, and smoothish: the tube of the corol very small in comparison with the calyx, which opens wide.

But enough for our second excursion, especially as I propose that we should take a third very soon.

ⁱ *Salvia pratensis*.

^m *Salvia verbenaca*.

LETTER XIII.

June the 24th, 1774.

I HAVE hastened this letter, dear cousin, lest the industrious mower should have spoiled our harvest. The brilliancy of the present season will perhaps have quickened his steps: but at the worst, he will have left you some gleanings about the hedges.

The tribe which I now recommend to your examination, is the most known and general of any; it is the most pleasant to the eye, and of the most extended use, since it furnishes man with the best portion of his nourishment, and at the same time is the whole support of many among the beasts, and of a large proportion of birds. The most rigid critic cannot accuse us of mispending our time, when we are engaged in the contemplation of so useful a tribe of plants as that which contains all the different species of corn and grasses.

The former being larger, requiring more care and culture, because they are annual, and being immediately necessary to the support of man, and the animals about him, in this and many other countries; the species are universally known and distinguished. But this is not the case in the latter: grass vulgarly forms one single idea; and a husband-
man

man when he is looking over his inclosure, does not dream that there are upwards of three hundred species of grass, of which thirty or forty may be at present under his eye. They have scarcely had a name, besides the general one, till within these twenty years ; and the few particular names that have been lately given, are far from having obtained general use : so that we may fairly assert that the knowledge of this most common and valuable tribe of plants is yet in its infancyⁿ.

Let us not however give more importance to Botany than it really has ; but proceed quietly with our own business. The greater part of the world scarcely know that grass has a flower ; or if they are shown it, will coldly ask, Is this all ? And yet grass not only has a flower, but every constituent part of it ; which is more than we can say of a tulip, and some others, that have engrossed almost all the attention of mankind : nay,

ⁿ The late excellent Mr. Stillingfleet first directed the public attention to *grasses* ; and that most respectable and useful institution, the Society of Arts, &c. has done all in its power to promote an improvement in the culture of them ; but without great effect. Nor can much be expected till œconomical gardens or public farms are instituted, for the purpose of experiments in this and other parts of husbandry. It is not enough to tell men of a good thing, and instruct them how it may be done ; but they must actually see it put in execution, and be eye-witnesses of its good effects.— This has lately been done by some public-spirited gentlemen ; particularly by Mr. Coke, of Norfolk. See *Young's Annals*.

there

there is such a variety in the parts, disposition, and manner of flowering, that we have sufficient marks in the fructification to distinguish above forty genera.

If you take up a spike or panicle of grass, you may perhaps be disappointed in your expectation of discerning the stamens and other parts ; be assured then that the flower is not yet open, and continue your search till you find one with the parts expanded, the slender filaments hanging out, and large, oblong, double anthers playing freely about with the slightest motion. You will immediately perceive that your grass having three of these stamens, must range under the third class, *triandria*, provided the flower has a pistil as well as stamens. Searching a little farther, you will easily detect two feathered, reflexed styles, each terminated with a feathered stigma : you are at no loss therefore to determine that your grass belongs to the second order (*digynia*) of this third class.

Having thus settled the class and the order, you will proceed to the other parts of the flower. The neglected chaff you will find to be double : the outer generally consisting of two leaflets ; one large and gibbous, the other smaller and flat ; the inner consisting also of two parts or valves, which you may call petals, for this is the corol, and the former is the calyx. Nay this despised flower has even its *nectary* ; which is a little

K

oblong

oblong body composed of two leaflets, but so small as to require a glass to discern it well. Grasses have no *pericarp*, but one naked seed, with the shape of which we are well acquainted—it is oblong, and draws to a point towards each end. These characters you will find common to every grass you examine, and also to every species of corn; or however with very few exceptions: this then is called the *classical character*. As these small flowers grow frequently two or more close together, you have only to separate a single flower to avoid confusion in your examination.

But this tribe of plants does not agree in the parts of fructification only, as above described. The whole appearance, the general air, the manner of growth, is the same in all. A simplicity of structure runs through the entire class. Every one has a simple, unbranched, straight, hollow stem, strengthened with knots at certain intervals°. There is none but has a single leaf to each knot, investing or sheathing the stem to some distance, and then spreading out into a long narrow surface, of equal breadth all the way, till it approaches the end, when it draws off gradually to a point^p. It is also invariably entire in every species; and without veins

° Linnæus names it *culmus*.

^p Linnæus calls this sort of leaf *linear*.

or branching vessels, being only marked longitudinally with lines parallel to the sides, and to a nerve or ridge that runs the whole length of it. There is another curious circumstance, almost peculiar to this tribe of plants, and common to them all; namely, that the body of the seed does not split into two lobes, but continues entire^a, till it has accomplished its purpose of giving the young plant its first nourishment, and then rots away: this you may easily observe as corn is springing up; or you may sow a little Canary grass-feed, which you have for your birds, in a garden-pot in your window, and thus make the observation at home. But though I may indulge you for once, you know I do not encourage this idle domestic manner of observing the operations of nature. You must go abroad and view her seated on her native throne: and in her court you have this advantage, which you will find in no other, that you are gathering health whilst you pay her homage.

If you are now mistress of all the circumstances in which this tribe of plants agree, you may proceed to those in which they differ, and thus separate them first into their genera, and then into their species. But the genera being numerous it may not be

^a Such plants are called *monocotyledonous*; the others; *dicotyledonous*.

inconvenient, as we did once before, to throw the whole tribe into some general subdivisions; and that we can easily do from the manner in which the flowers are produced—either in a panicle or spike; and singly, or several together. Hence we shall get four subdivisions:

1. Flowers single — — 14 genera.
2. Flowers two together — 2 genera.
3. Flowers many together — 7 genera.

These are mostly panicled: in all the flowers are irregularly disposed, or *wandering*, as Linnæus calls them.

4. Flowers in a spike, with a subulate receptacle — — — — 6 genera.

Including wheat, rie, and barley. Oat is in the third division.

Your pot of Canary feed, if you do not pull up all the plants to verify what I told you before, will serve for an instance of the first division. When it arrives at a state of perfection, you will observe that the two leaves of the calyx are flatted, boat-shaped, have a keel running along them, and are equal in length; the corol is less than the calyx, and inclosed within it. This is the character of the genus. It is specifically distinguished by the form of the panicle resembling a spike, and being ovate, the

chaffs being turgid and hairy, but the keel smooth. It is an annual grass: is found wild in the Canary Islands, whence its name of *Phalaris Canariensis*, and is cultivated in Europe for the food of Canary and other small birds.

Whilst your Canary-grass is growing you must go out in search of other instances of this first division; for I must absolutely insist that you ransack the neighbouring meadows and pastures before the furious scythe has levelled all their honours.

Meadows of a good quality abound in *Fox-tail grass*^r, which is indeed one of the earliest, as well as the most excellent, for hay and feeding cattle. This genus is an exception to one of the general characters; for though the calyx has two valves or leaves, the corol has but one. You will readily discover the species by the cylindric shape and hoary appearance of the panicle, which from its form you will take for a spike, the erectness of the stalk, and the corols not being bearded.

Cat's-tail grass^s is another of these; the spike has not the smooth hoary appearance of the last, but seems rough, and is known at first sight by the truncated and forked termination of the calyxes, which are also linear, and sit close to the stem. The corol is shut

^r Alopecurus pratensis Linnæi. Stillingfl. t. 2.

^s Phleum pratense. Lin. Scheber t. 14.

up within the calyx. The shape of the spike is cylindric; the keel of the chaffs is ciliate^t, and the stalk is erect. The spike of Cat's-tail grass is sometimes four inches long in moist meadows, in dryer, poorer soils, it decreases in length, until it dwindles to half an inch; and even less in hard barren ground, such as way sides and heaths. In these last it cannot raise itself upright; and the roots, not being able to spread themselves freely, grow knotty and bulbous. I mention these circumstances that you may be aware of the changes wrought in plants by soil and situation; and not suppose that a new species presents itself every time you meet with these and other slight variations. If you transplant from the heath into your garden, a dwarf, crooked, knobby-rooted plant, I dare engage that the stem will become erect, that the spike will lengthen, and the bulbous root change to a fibrous one. It is not however always easy to say what is a species, and what a variety only. A great deal of observation and experience is necessary in many cases to determine this with precision. Most varieties indeed are produced by culture, or a change from their native soil and situation: and, when they regain their natural state, will return to their pristine form: if this were universally

^t Set with little hairs like the eye-lashes.

so, there would be no difficulty to ascertain the species from the variety. But it sometimes happens that when accident has produced a variety, it continues permanent, and having once tasted a polished situation, refuses to return to a state of nature: our test therefore is not a certain one.

The second division of the grasses having only two genera, the distinction is easy: they are known from the rest by having two flowers growing together; and from each other by the rudiment of a third flower between the two others, in the *Melica* of which there is no sign in the *Aira*.

Of the third division you will find abundance of grasses sufficiently common: *Briza* or ladies hair, *Poa* or meadow grass, *Festuca* or fescue, *Brome*-grasses, oats with all the oat-grasses, and the reeds. The genera are thus distinguished;

Corol cordate: valves turgid,	-	<i>Briza</i> .
Corol ovate: valves rather sharp,	-	<i>Poa</i> .
Corol oblong: valves pointed,	-	<i>Festuca</i> .
—————: valves bearded below		
the point,	- -	<i>Bromus</i> .
—————: beard wreathed or		
bent,	- - - -	<i>Avena</i> .
Corol woolly at the base: awnless,		<i>Arundo</i> .

The *Brizas*, of which there are five sorts, are very pretty grasses; insomuch that one of them is cultivated in gardens for its beauty and singular appearance. They flower early in the month of May, grow in a loose panicle, the foot-stalks of which are so slender as to be moved by every wind; whence they have obtained the name of *Quaking grasses*. By these circumstances, and their general air different from their other neighbours, you cannot fail of knowing them. The three sorts which you are likely to meet with are thus distinguished:

1. Spiculæ^u triangular: calyx longer than the flower. *Little Briza*.
2. Spiculæ ovate: calyx shorter than the flower. *Middle Briza*.
3. Spiculæ cordate: 17 flowers. *Great Briza*.

The second is the sort which is common in meadows, and the third is that which is cultivated in gardens: in this the flowers grow in a *raceme* rather than a panicle.

The *Meadow-grasses* are numerous, there being no less than 33 sorts registered by Linæus, and several of them are thrown abundantly from the lap of nature; for perhaps they are the best of all the grasses for

^u These are the little assemblages of flowers, or ultimate subdivisions of the panicle or whole.

pastures,

pastures, the quantity of their produce being very great, their quality excellent both for green and dry food, and their verdure most fresh and pleasant. But we are not husbandmen, dear cousin, Botany is our pursuit.

There are four sorts of *Poa* very common in most meadows: which I shall distinguish by the names of 1. Great, 2. Trivial, 3. Narrow leaved, and 4. Annual. They all flower in a loose branching panicle. The stalks of the first sort are generally erect, and throw out runners: the leaves are rather blunt at the end, and the membrane at the bottom is short and blunt: the spiculæ are ovate, and on short foot-stalks; the flowers growing close together, most commonly five in number. Every part of this grass is smooth. The second sort is distinguished by the leaves being sharper at the end, and having the membrane at bottom long and pointed: the spiculæ consist of two or three flowers, very seldom four. The whole of this species is rough. The third has the stems more erect: the leaves sharp-pointed and roughish, but smooth where they sheath the stalk: the panicle is more erect than the others; the spiculæ on longer foot-stalks, with from one to six flowers, which are hairy at the base.

1. Curtis, Lond. II. 5.
2. Curtis, Lond. II. 6.
3. Morison's hist. f. 8. t. 5. f. 19.
4. Curtis, Lond. I. 6. Stillingfl. t. 7.

These

These three are perennial. The fourth is annual, and smaller than the others; extremely universal, and in flower the greatest part of the year; it has a very loose spreading panicle growing all on one side^v, the lower branches of it often coming out in pairs: the spiculæ producing 3 or 4 flowers: the stalk is oblique and compressed.

I must give you one caution in examining these and the rest of the panicked grasses, which is this—that you should take them at the time when they are arrived at full maturity; that is, when the panicle is completely expanded, and the flowers show their stamens: for, at different periods of their existence, these grasses put on such various appearances, that they have deceived many eminent botanists into forming several species out of one. To have the history of a plant complete, we ought to examine it every day during the whole time of its growth. What a work would such a history of ten thousand plants form! but the book of nature is inexhaustible.

The genus *Festuca* or *Fescue* grass, though less numerous than the last, yet contains 19 species. *Sheep's fescue*^w is a well known grass, always to be found in dry pastures, and sheep commons. It has a close contracted panicle, growing on one side; the spiculæ having

^v This is what Linnæus calls *Panicula secunda*.

^w *Festuca ovina*. Stillingfl. t. 8.

from 3 to 6 flowers; the valves of the flowers are very sharp pointed, but seldom properly awned; the culm is rather square than round, almost naked, and the leaves are setaceous*.

Another Fescue^y, extremely different from the former, grows in watery places, ponds, and ditches. It has a loose panicle of a considerable length, but little branching, growing on one side; the branches of the panicle are sometimes single and sometimes double; the spiculæ are round, linear, and awnless, almost an inch long, and pressed close to the stalk; varying in the number of flowers from 9 to 12. The leaves are not round like those of the last, but flat; and the culm is very long, procumbent, branching, and flattened. The seeds of this being large and sweetish are gathered for the table in Poland and some other countries, and appear there under the name of *Manna*.

In this grass we have another instance of the changes wrought by soil and situation. Three species having been made out of one, until experiment detected the truth, and informed us that the seeds of the *flote* Fescue sown in a dry soil, become the first year *spiked*, and the second *meadow* Fescue-grass. Nay *tall* Fescue, a fourth species, has so many marks in common with the last, that it is matter of

* Very narrow, like those of rushes.

^y *Festuca fluitans*; flote Fescue. Curtis, Lond. I. 7.

doubt whether this also may not be a variety only^z.

The *Bromes* are very nearly allied to the *Fescues*. They are distinguished however by being all bearded, and the beard or awn springing from the back, or below the tip of the chaff: whereas the *Fescues* are often beardless; and when the flowers have a beard, it is an elongation of the chaff itself.

No grass is more common in many pastures than *Field Brome grass*. It has a loose unbranched panicle: the spiculæ are ovate, the flowers are obtuse, and the beards are straight. It is an annual plant: and varies so much as to have obtained the name of *polymorphus* or *many-formed*. The two principal varieties^a are, 1. that which has a soft down all over the panicles, leaves and stalks; with larger, heavier spiculæ; 2. that which is smooth all over; with the spiculæ thinner, and not hanging down so much, but often rather erect. Between these are two other varieties, 1. with the leaves downy, and the panicle almost smooth; 2. with the lower leaves only a little downy, and the panicle quite smooth. Other connecting links may easily be remarked by those who are industrious in hunting after varieties.

^z See Hudson *Flora Anglica*, edit. 2. p. 47.

^a *Bromus mollis* & *secalinus* Linnæi. Mr. Hudson, after Scopoli, has very judiciously made them one, under the title *polymorphus*. Curtis, Lond. I. 8. figures the *mollis*—Morison figures this in t. 7. f. 18; and *secalinus* in f. 16.

There

There are three very large species of this genus, to be met with in woods and hedges, but seldom in pastures^b. They have great, branching, nodding panicles. *Barren Brome* is not very tall; but the *Giant* and *Wood Bromes* are three feet in height. Their size, added to the character and air of the genus, mark them out so well, that you will not easily mistake when you see them.

You will get an idea of the *Oat grasses* from the corn of that name, which having the parts of fructification larger than in the grasses, gives you an advantage in the examination. *Bearded Oat grass*, vulgarly called *Wild Oats*, is also well known as a dreadful weed among corn. *Yellow Oat grass* is common in meadows and pastures; it is a neat pretty grass; and will discover itself to you by the fineness and yellowness of its panicle.

The characters of the above mentioned species are these:

1. Two flowers in one calyx: the seeds smooth, and one of them bearded. *Cultivated Oats*.
2. Three flowers in one calyx: hairy at the base; and all of them bearded. *Wild Oats*.
3. Panicle loose: three flowers in a short calyx; and all of them bearded. *Yellow Oat grass*^c.

^b *Bromus sterilis*, Curtis I. 9. *giganteus* & *nemoralis*.

^c *Avena sativa*, *fatua* & *flavescens* *Linnaei*. Curtis, Lond.

The woollyness of the flowers in the *Reed* will show you this genus as soon as it unfolds its panicle. It is a grass, though vulgarly not regarded as such, because it is not used for the same purposes with the grasses. That however makes no difference to us, whose province it is not to regard the uses to which plants are put, but their structure. If husbandmen will not admit Reed to be a grass, they take in other plants to their idea of grass which we exclude, such as Clover, Lucerne, Saintfoin, &c. The reason is, that they consider grass as an herb adapted to feed cattle: whereas naturalists define it to be an herb which has generally three stamens and two pistils; always an unbranched, knotted, hollow stem, and simple linear leaves.

Though you are perfectly acquainted with the Reed^d, it is perhaps rather by seeing it nodding its large panicles in the water at a distance; or else by the use which your gardener makes of the long light stems for hedges to guard his tender plants, than by its fructification. You will not therefore be displeased to be told that it is distinguished from the other species, which are fix, by the looseness of its panicle, and by having five flowers growing together.

You are now arrived at the last division

^d *Arundo phragmitis* Linnæi.

of corn and grasses, containing those whose fructification is always in a spike properly so called. Of these,

Secale or *Rie*, has two flowers included in the same calyx.

Triticum or *Wheat*, has several flowers in one calyx.

Hordeum or *Barley*, has a six-leaved involucre, containing three flowers; and the flowers simple.

Lolium or *Darnel*, has a one-leaved involucre, containing one flower only; but that flower compound.

Cynosurus or *Dog's-tail grass*, has a one-leaved lateral involucre, and a compound flower.

In *Rie*, the exterior valve or chaff of the corol ends in a long beard or awn. The flowers are sessile, and there is frequently a third between these, which is less and pedunculate: the filaments hang out of the flower. Our cultivated species^e is known by the rough hairs upon the chaff.

In *Barley* also the exterior valve of the corol ends in a long awn. The flowers are sessile. The filaments being shorter than the corol do not hang out, and therefore

^e *Secale cereale Linnæi.*

Barley

Barley is not liable to be damaged by rain as *Rie* and *Wheat*.

There are four sorts of *Barley*.

1. The *common*, distinguished by its two rows of erect beards; all the flowers being perfect and bearded.

2. The *long-eared*, having the grains regularly ranged in a long double row, lying close over each other; and flowers on the sides, without pistils or beards.—These two species have the chaff very thin.

3. *Sprat Barley*, with shorter, broader ears, longer beards, the grains placed closer, and the straw shorter and coarser. This also has imperfect flowers on the sides of the ear.

4. *Winter* or *Square Barley*, very distinct by having six rows of grains equally ranged, all furnished with ears, and perfect. The grain of this is large.

Besides these species of corn, the genus contains several grasses. *Wall Barley grass*^f is very common by way-sides, and under walls: and *Meadow Barley grass*^g, which is very like it, only that it has a longer stalk, and a shorter spike, is found in moist meadows. The common name of this last is

1. *Hordeum vulgare*.

2. *Hordeum zeocriton*.

3. *Hordeum distichon*.
called also *bear* and *big*.

4. *Hordeum hexastichon*;

^f *Hordeum murinum* *Linnaei*. *Fl. dan.* t. 629. *Mor. hist.* t. 6, f. 4.

^g *Hordeum pratense*. *Mor. hist.* t. 2, f. 6.

Rie

Rie-grass; and indeed it resembles *Rie* more than *Barley*. I have seen it cultivated alone; but the sort which is generally sown, and vulgarly called *Rie-grass*, is in reality *Ray-grass*, which will be announced to you presently. These two sorts, though apparently so alike, and thought to be but varieties by many, are however very distinguishable: the *Wall Barley-grass* having the imperfect lateral flowers bearded, and the intermediate involucre ciliate; whereas the *Meadow Barley-grass* has the same flowers beardless, and the involucre very narrow, like bristles, and rough.

In *Wheat* the exterior valve of the corol is sometimes bearded, but not always. There are generally three or four flowers in the same calyx, and the middle one is frequently imperfect. The filaments hang out, but not so much as in *Rie*.

1. *Common Wheat* has four flowers in one calyx, the chaffs are smooth, turgid, imbricate; sometimes it has short beards, but more often none: hence and from the colour, &c. are several varieties which husbandmen notice, and we have nothing to do with.

2. *Summer or Spring Wheat*, has also four flowers together, and agrees with the former in the other characters, except that it is always bearded.

1. *Triticum hybernum*.

2. *Triticum æstivum*.

L 3. *Gray*

3. *Gray Wheat* has villous, turgid, imbricate, obtuse chaffs, containing four flowers. The ears are large, heavy, and nodding; the beards are very long, and drop off when the grain is full grown: the chaff being villous all over, gives the ear a gray appearance.

4. *Cone Wheat* has villous, turgid, imbricate chaffs; and the ear of a pyramidal form, ending in a slender point: the beards are long and rough.

5. *Polonian Wheat* has two flowers only in each calyx, which are naked, and have very long awns; with the teeth of the *rachis* or receptacle of the spike bearded. The ears are long and heavy.

6. *Spelt* has four flowers, but two only produce any grain; the outer ones are abortive, as the lower ones are in every ear: the outer chaff of the perfect flowers has a beard about an inch long. The flowers are more conical, and the grain is less than in wheat: the chaff also is adherent.

Few plants are more universal than one grass of this genus: it is known by the name of *Dog's-grass*, and generally execrated by husbandmen under the name of *Couch*, or

3. *Triticum turgidum*: called also *Gray Pollard*, *Duck-bill*, and *Fuller's Wheat*.

4. Not noticed by Linnæus.

5. *Triticum Polonicum*.

6. *Triticum Spelta*. I do not know that this sort is ever cultivated in England.

Quich, which is but a corruption of *Quick*, the ancient term for *living*. It well deserves this appellation, for it runs prodigiously at the root, and, like Hercules's hydra, the more you hack and cut it the faster it propagates itself. It is distinguished from the several species of corn by the smallness of the ear and the grain, and also in being perennial; whereas all sorts of corn are annual: from the other grasses of the same genus, by having many flowers, about five generally to one calyx, and those not bearded, but very sharp-pointed at the end^b. There is another species, which has about four flowers in a calyx, and is beardedⁱ. This grows in woods and hedges.

Before I quit this genus I must observe, as a singularity, that it is not known, with any degree of certainty, to what country we are originally indebted for the several species of corn, or whether they now grow wild in any. One says that Wheat came first from Africa; others, with more probability, that it travelled into Europe from the East. Linnæus affirms that Rie grows naturally in Crete^k; and Spring Wheat, with Sprat Barley (*Hordeum distichon*) in Tartary; but upon what authority I know not. A

^a *Triticum repens* Linnæi. Fl. dan. 748. Mor. hist. t. 1. f. 8. The number of flowers varies from 3 to 8. Hudson.

ⁱ *Triticum caninum* Linnæi. Mor. hist. t. 1. f. 2.

^k It is said also to be wild in Siberia.

late traveller also found barley and oats in Sicily growing like weeds among the bushes, but he does not pretend to determine whether they grew there originally wild, or whether they were stray deserters from the fields where they had been cultivated¹.

Lolium or *Darnel grass* is an exception to the general character; for it has only one chaff or leaf to the calyx. The reason of this is, that the spiculæ are sessile, and in the same plane with the culm, which by this position is enabled to perform the office of the deficient leaf of the calyx in protecting the seed. This single chaff contains several flowers. of the two common species in this genus one is *perennial*^m, the other *annual*ⁿ.

¹ Voyage en Sicile, &c. Lausanne, 1773. Diodorus Siculus from the report of others, and Pliny assert that, grain grew in the Leontine fields, and other parts of Sicily spontaneously; but this was only during the reign of Ceres. Aristotle also says (de Mirabil. Auscult.) that there is a wild Wheat in the neighbourhood of Mount Ætna. The passage in Homer's *Odyssæy* is well known:

“ The soil untill'd a ready harvest yields,

“ With Wheat and Barley wave the golden fields.”

Wheat, Barley, Vetches, Sesame, &c. are said, by Berossus, to be wild in Babylonia, between the Tigris and Euphrates.

^m *Lolium perenne* *Linnaei*. Fl. dan. 747. Mor. hist. t. 2. f. 2. This is the sort which has been long cultivated in England under the name of *Rie grass*, which is a corruption of *Ray-grass*; and that is derived from the French *Yrway*, a name given to the second sort, from its quality of affecting the nerves, something like drunkenness: which makes it to be reputed a dangerous weed among Wheat.

ⁿ *Lolium temulentum* *Linnaei*. Fl. dan. 160.

The

The first is found naturally in meadows, pastures, and by way-sides. The distinctive marks of the species are, that the spiculæ in the first are longer than the calyx, and the flowers beardless: whereas in the second, which is a weed among the corn, the spiculæ are only of equal length with the calyx, and the flowers have short beards. Sometimes however it happens that the flowers of the perennial sort have little beards, and those of the annual none: but you may always know them, not only from their duration and place of growth, but because the second is larger in every respect; the stalk higher, the spike longer; the spiculæ also are much more remote, so that they do not touch each other, as they do in the first.

Cynosurus, or *Dog's-tail grass*, was the last-mentioned of this division. The character of the genus is taken from a lateral leaf to each calyx, which Linnæus calls the receptacle, involucre or bractæ: this gives the spike an air by which the genus is easily known from all others. There is an elegant species^o, very general in parks and on commons, and found also in other pastures, which has these bractes pinnatifid, or toothed like a comb: the corol does not open, but closely invests

^o *Cynosurus cristatus* Lin. Crested Dog's-tail. Stillingfleet, t. II.

the seed, which therefore does not fall; the spiculæ have from three to five flowers, are all turned the same way, and do not fit close to the receptacle, or common stalk of the spike; one peduncle supports sometimes two or three of these spiculæ. The stalk is very erect and slim, and the leaves are narrow and smooth.

There remain still some grasses which militate against the artificial system, and are therefore not to be found in the third class of Linnæus's. But as we are not bound to follow him servilely, we will rather follow nature, who is a better guide.

Earlier than most of the rest flowers a grass, called from thence *Vernal Grass*†. Linnæus has named it *Anthoxanthum*, from the yellowness of its spike. This will serve at present to introduce it to your acquaintance, until you have an opportunity next spring to examine the flowers more minutely. It has obtained the epithet of *odoratum* from the sweet odour which it communicates to hay. This genus stands alone in the second order of the second class. Each calyx sustains but one flower; each valve of the corol has an awn, one bent, and proceeding from the base, the other almost from the top: the two filaments are very long; and the two styles are filiform: the chaff of the corol adheres to the

† Curtis, Lond. I. 4. Stillingfleet, t. 1.

seed. There are three species of the genus : ours is distinguished by the spike being of an oblong form ; and the flowers growing on short peduncles, and being longer than the beards.

There is also one species of grass, called *Cinna*, in the second order of the first class.

But in the first order of the twenty-third class^a are several genera ; of which the *Holcus* or *Soft grass* is most likely to come under your observation. This, and all the others have smaller imperfect flowers among the perfect ones ; a circumstance which constitutes them of that class. They have all bivalvular chaffs for calyx and corol : three stamens, two pistils, and one seed : together with the whole port or air of the plants we have been just considering : circumstances which plainly denominate them grasses. *Holcus* differs from its neighbours, in having two flowers inclosed in one calyx, which is beardless ; whereas the outer valve of the corol generally has a beard. The imperfect flowers have neither corol, pistil, nor seed ; but only three stamens within the bivalvular chaff of the calyx. The two common wild species are thus distinguished : *Meadow Soft grass*^r has villous chaffs : the perfect flowers are beardless ; the imperfect have a bent awn. *Creeping Soft grass*^s has smoothish

^a Polygamia Monoecia.

^r *Holcus lanatus* *Lin.* Curtis, Lond. IV. 11.

^s *Holcus mollis* *Lin.* Schreber. t. 20. f. 2.

chaffs :

chaffs: the perfect flowers are beardless, but the imperfect have a jointed awn. They are very much alike, but the calyx is more acute in this than in the former, or indeed than in any of the species. The first grows in pastures; the second in corn-fields and hedges.

Since it is not uncommon to find incomplete or imperfect flowers among those which are perfect, in many of the grasses, which are ranged by Linnæus in his third class; you will perhaps ask me why he has not either put them also in the twenty-third, or else ranged them all together in the third. To this question I cannot return you a better answer, than that the imperfect flowers seem not so constant and regular in the one as in the other; or perhaps are to be met with only in one species of the genus.

We have now run through the grasses: there are many other plants very nearly allied to them; as *Schoenus* or *Bog rush*, *Cyperus*, *Scirpus Club rush* or *Bulrush*, all three very numerous genera, *Eriophorum* or *Cotton-grass*, &c. in the first order of the third class. *Cat's-tail*, *Bur-reed*, and all the *Carices* or *Sedges*, in the third order of the twenty-first. These have the manner of growth, the leaves, the appearance of grass; they have also three stamens: but the stalk is filled with a spongy substance, and the flower is destitute of petals. Finally the *Rushes* and some few others, in the first order of the sixth class, have a six-leaved calyx, a hexapetalous

hexapetalous corol or none, six stamens, and the seeds in a triangular capsule.

I have not told you all this while that *Sugar*^t is a grass of the first division, which perhaps you did not expect. But if you are not tired, dear cousin, I am; so adieu for the present.

3 *Saccharum officinarum. Lin.*

LETTER XIV.

July the 1st, 1774.

YOU are not to suppose that, because the last letter was engrossed wholly by Grasses, the third class therefore of the system contains no other plants. In truth there are no fewer than seventy-six genera, and six hundred and eighteen species, in the three orders of this class taken together. You see however that though the grasses do not occupy the whole, they make a very large proportion of it.

There are some very beautiful genera in the first order of this class, particularly the *Ixia* and *Iris*, or *Fleur-de-lys*^a. These with *Crocus*, *Gladiolus*, *Antholyza*, and a few others not easily met with, agree in having a *Spathe* or sheath instead of a calyx; a corol of six petals, or at least cut into six parts; generally three stigmas, or one that is trifid; and a triangular, trivalvular, trilocular capsule to inclose the seeds: they have also long, narrow leaves, something resembling those of grass—Linnæus calls them

^a Corrupted into *Flower-de-luce*.

Ensisform, or *sword-shaped*^b. These plants are very nearly allied to the liliaceous tribe^c, and are indeed enrolled in it by the generality of authors who have aimed at framing a natural arrangement.

Take any species of *Iris*, either the *blue*^d or *white*^e sorts, which you have so abundantly in the borders of your shrubberies, and plantations; or else the *yellow*^f one, common in wet places, and usually called *flag*. In the first place you will observe, that whether the flowers are open or closed, each has its own sheath, separating it from the others. The corol at first seems to consist of six petals, but you will quickly see that the parts are all united at the base: the three outermost of these parts or petals are bent downwards, and thence are called *falls*; the three inner ones stand erect, and have the name of *standards*. In the centre of them are three other peals, as they seem to be; but in reality they are the stigma thus divided into three parts; and under each division you will detect a single stamen lurking, with the filament bent along with the stigma, and terminated by a large oblong, flattened anther:

^b Hence in his *Natural Orders* he has kept these together, with the addition of some others, under the title of *Ensiferae*.

^c See letter I.

^d *Iris Germanica Linnæi*.

^e *Iris Florentina Linnæi*.

^f *Iris pseudacorus Linnæi*. Curtis, Lond. III. 4.

for the germ you must search below the flower, and there you will find it a green oblong body; which, when the flower is faded and fallen, becomes in most species a three-cornered capsule, opening by three valves, and having the seeds ranged in three cells. We have not yet noticed a set of small bodies forming a villous line along the middle of the reflexed petals; but this you perceive is not common to all the species, your blue and white Iris having it, but not your yellow flag: it cannot therefore be a mark of the genus. However it may serve the purpose of subdividing it, or furnishing a specific character. When you have finished with the fructification you will remark that the leaves are very narrow in proportion to their length; and that they are not unaptly termed ensiform from the similitude of their shape to that of a broad-sword. If you can have the heart to pull one of these fine plants out of the ground, you will see that the roots are not fibrous, but oblong and fleshy: I guess however that you will take my word till the autumn, when the gardener will be removing some of them, or at least exposing their roots, when he digs his borders.

You may distinguish the *blue* or *German*, the *white* or *Florentine*, and the *yellow* or *marsh Iris*, specifically thus: The two first have the corols bearded; the first and third have several flowers upon the stem; the
second

second has only one or two flowers, and the peduncles are not so long as in the first; the third has the corols beardless, and the interior petals less than the divisions of the stigma^s. But why all this parade, say you, when we know them by their hues; blue, white, and yellow? Trust not too much to colour, fair cousin. What if an Iris were to present itself with blue flowers, and only one or two on the stem, or without beards; or with the flowering stem shorter than the leaves, would such be of the same species, merely because the corol is of a blue colour? No surely: and we pay more respect to these circumstances than to colour, not because we esteem them more, but because they are more certain and permanent.

The *Chalcedonian* Iris^h has stems two feet and an half high, supporting one very large flower; the three standards are very broad and thin, with black and white stripes; the three falls are of a darker colour: this is one of the bearded sorts.

Among these handsome specious plants, let us not forget the humble *Persian* Irisⁱ, seldom rising three inches from the ground, but beautiful in its colours, fragrant in its

^s They are all three distinguished from some other species by the flowering stalk standing up superior to the tips of the leaves.

^h *Iris fusiana Linnæi.*

ⁱ *Iris Persica Linnæi.*

scent,

scent, and flowering at a time when few beauties dare trust themselves to dubious skies and inclement air^k. One or two flowers come out together: the standards are of a pale sky blue; the falls are of the same colour on the outside, but the lip has a yellow streak running through the middle, and on each side are many dark spots with one large deep purple spot at the bottom: they have no beard. The leaves are hollowed like the keel of a boat, and are about six inches long. You will be glad to entertain this pretty dwarf, when there is little else to amuse you in this way besides Crocusses and Snowdrops.

I have sent you this little nosegay of handsome flowers, to make you amends for all the dry chaff and hay with which I fatigued you in my last.

* February. This is figured in Curtis's Magazine, n. 1.

L E T T E R X V .

July the 8th, 1774.

CONSCIOUS, dear cousin, that the nosegay of my last was too small to employ you long, I have hasted to send you the fourth class, which is rather more numerous than the third in the genera, of which it contains eighty-five; but far less so in the species, there being no more of these than three hundred and ninety.

You will have some examples in this class of *aggregate* flowers, the general nature of which I explained to you before¹; but you will be perfect mistress of it I am persuaded, when you have considered the structure of the *Teasel* and *Scabious*. These and all others of this natural order have monopetalous corols, succeeded by one seed, to which they are superior. A number of these are included within one common calyx, as in the compound flowers, from which they differ, in having the stamens four in number, and totally distinct, with a calyx proper to each little flower; they might however easily be confounded with compound flowers, if the general form and appearance only were attended to.

¹ In letter VI.

The two genera of *Teasel* and *Scabious* agree in having the common calyx polyphylous, or consisting of many leaves. The first has chaffs between the flowers on the receptacle, or common base of them all; the form of which is conical. The second has these chaffs in some species, but in others the receptacle is naked; the form of it is convex: it is remarkable for a double calyx to each little flower, besides that which is common to the whole. The leaves of the calyx are very long in the *Teasel*, and in several rows in the *Scabious*.

Such are their principal generic distinctions. Common *Teasel* is separated from its congeners, by its sessile leaves, which are ferrate or toothed about the edges. The conical head of the *Teasel* is furnished with stiff beards, which in the wild sort^m are straight, but in the cultivated hookedⁿ. This difference did not seem to Linnæus considerable enough to make them specifically distinct. Haller, Jacquin, and others, are of a different opinion; and it is now generally allowed that the cultivated *Teasel* is of a species distinct from the wild one.

Of *Scabious* there are no less than thirty-four species. The genus divides conveniently into such as have the corols of the

^m *Dipsacus sylvestris*. Curtis, Lond. III. 9.

ⁿ *Dipsacus fullonum* Lin.

little flowers divided into four, and such as have them divided into five segments: of the first there are fourteen, of the second twenty species. Of our three wild sorts two are in the first division, and one in the last. The common field Scabious^o is a large, tall plant; the stalk is hairy; the lower leaves are sometimes almost entire, sometimes they, as well as the leaves upon the stem, are pinnatifid. The outer flowers are larger, and have the corol deeper cut than the middle ones, and the outer segments are also largest: they are of a pale purple colour.

The other species with quadrifid corols is called *Devil's-bit*^v, because it has a short tap root, which appears as if the end were bitten off. The stalks of this are not so high, nor are they branching as in the first: they generally send out two short peduncles from the upper joint, opposite to one another, each terminated by one small blue flower, as is the principal stalk by one larger; the little component flowers are not irregular as in the former. The leaves are simple and entire, (except some on the middle of the stem, which have a few teeth,) oblong and drawing to a point at each end. This species grows in pastures and woods, and flowers later than the first, which is common in corn fields, and not uncommon in pastures.

^o *Scabiosa arvensis* Lin. Curtis, Lond. IV. 13.

^v *Scabiosa succisa* Lin. Curtis, Lond. III. 10.

Small Scabious¹, besides having quinquefid corols, is distinguished from the two others by having the leaves next the ground ovate and notched about the edges, whilst those upon the stem are pinnate; towards the bottom the pinnæ are broader, but in the upper ones very narrow: there are about eight pair of these, and the terminating lobe is large. The aggregate flower is produced single, on a long peduncle, the outer little flowers larger, and very irregular, as in the first species, of a pale blue colour. It is common in pastures, especially where the soil is chalky.

Before you are got thus far, I am persuaded your own mind has suggested to you that a plant with dark purple flowers, and a strong sweet odour, which your gardener sows every year in the borders, is of this genus. The name of *Sweet Scabious* has not led you, who are not governed by mere names, to suppose this, but the evident similitude in the structure. An accurate examination of the flower will confirm your suspicion; and you will find it to be one of those which have quinquefid irregular corols; the receptacle of these is oblong; the common calyx consists of twelve linear folioles, of the length of the aggregate flower, and bent back: the leaves are finely cut². The colour

¹ *Scabiosa columbaria* Linn. Fl. dan. t. 314.

² *Scabiosa atropurpurea* Linn.

of the corol varies from black to pale purple, red and variegated, and sometimes the main flower is surrounded by a set of very small ones on slender peduncles, as in the *Hen and Chicken Daisy*; but all these are confessedly no other than feminal varieties: though now so common with us, this plant is originally from the Indies.

This class comprises another natural order of plants, entitled *Stellated*, from the manner in which the leaves grow upon the stem, several together in sets one above another, radiating like the points of a star, as it is commonly represented. I must observe to you, that though in this case, and in many others, a class or order takes its name from an obvious or striking circumstance in its structure, yet it does not follow that all plants which have that structure are to be looked for there, or that this is the only or even principal reason of their being kept together. When a plant of this or that general appearance presents itself, you may reasonably presume that it ranks in this or that order; but outward appearances must not carry you beyond presumption, and it is the structure of the fructification that must determine you at last^s.

^s See what was said upon this subject with respect to the Elder in letter V. I must add that use and practice is necessary to give the proper tact in natural objects as well as works of art: the similitudes and analogies that ignorant persons find being usually truly ridiculous.

In the *Stellated* plants the structure is this: the calyx is extremely minute, divided into four parts, and permanent: the corol is monopetalous divided into four segments; the stamens are four in number; the germ is double, and below the flower; the style is bifid; the fruit is globose, and contains two seeds. The stalk is quadrangular.

All the genera of this order resemble each other so much, that some authors have reduced them into one. *Madder* has a bell-shaped corol, succeeded by two berries with one seed in each. *Sberardia* and *Woodroof*¹ have funnel-shaped corols: the first has a little crown to the seeds, the second has them globose, without any crown. *Galium* has a salver-shaped corol, and two roundish seeds. This last genus has twenty-six species, twenty of which have the fruit smooth; in the remaining six it is rough. The number of leaves in each star or whorl, together with the shape of them, gives the principal specific distinctions.

White Galium, or *White Ladies Bedstraw*², has four leaves in a whorl towards the bottom of the stem, and six narrower ones higher up. *Great Ladies Bedstraw*³, has eight, a little notched about the edges, ovate in

¹ *Asperula odorata*. Curtis, Lond. IV. 15.

² *Galium palustre* Lin. Fl. dan. 423.

³ *Galium Mollugo* Lin. Mor. hist. l. 9. t. 22. f. 1.

form,

form, and terminating in a point or little hook. *Yellow Ladies Bedstraw* ^w has also eight leaves, but they are very narrow, and furrowed; the flowering stalks are very short, and the corols are yellow. The first grows in moist meadows, and by river sides; the second in hedges, and on heaths among the bushes; the third is very common in pastures, on balks, and by way sides. These three all have smooth seeds. The common *Galium* ^x, known by the name of *Goose-grass* or *Cleavers*, every body knows to have rough seeds, by their sticking to the clothes as we pass near the hedges. The leaves also are rough, lance shaped, and eight in number. The flowers of all the species, and indeed of the whole tribe, are very small, but the plants are known at first sight by their air.

The *Plantains* are also of the first order of this class *Tetrandria*: they are numerous, for there are twenty-four species of them. As a great number of small flowers grow together in a spike or oblong head, you must separate one of them to examine the parts of the fructification distinctly. You will then find that each of these small flowers has a quadrifid calyx and corol, with the border of the latter reflexed; the filaments are remarkably

^w *Galium verum* *Lin.* *Mor. hist. f. 9. t. 21. f. 1.*

^x *Galium Aparine*, *Curtis*, *Lond.* II. 9.

long: and the seed-vessel is a bilocular capsule, opening horizontally, and placed above the receptacle.

The *Great* ^w and *Ribwort* ^x Plantains are doubtless well known to you; the first so common by way sides, and the second in pasture grounds. The *Great Plantain* is distinguished by its ovate, smooth leaves, and its round, naked, flowering stalk ^y terminated by a long spike of flowers laying close over each other ^z. *Hoary Plantain* ^a is nearly allied to this, but the leaves are longer, and white with hairs; the spike is cylindric, but shorter and thicker than in the first. *Ribwort Plantain* has the leaves lance shaped, a short, naked, ovate spike; the scape angulate, and twisted. This, and the other species have the leaves marked lengthwise, with very prominent ribs or nerves.

By submitting to examine these plants, which you was already acquainted with, you will acquire a facility in discovering such as are strangers to you; for you have too much sense to despise them because they are common, or destitute of beauty: in confidence of this, I have been studious to select rather

^w *Plantago major* *Lin.* Curtis, Lond. II. 11.

^x *Plantago lanceolata* *Lin.* Curtis, Lond. II. 10.

^y This Linnæus calls *scapus*, from its resemblance to the shaft of a column. ^z Imbricate.

^a *Plantago media* *Lin.* Curtis, Lond. IV. 14.

such plants as you may readily meet with, and are proper for examination, than those that are most rare and valuable. If you were in the neighbourhood of a famous botanic garden, I might be nicer in my choice, and at the same time present you with greater variety, but perhaps after all I might not be more useful, or you more amused: at least I shall hope for the continuance of that indulgence a little longer with which you have hitherto honoured me^b.

But to return to our business; there is a plant of this fourth class and first order, which I must not omit presenting to you, were it but for the name's sake. *Ladies Mantle* has a calyx of one permanent leaf, divided into eight segments, four of which are larger, and four smaller; it has no corol; and only one little seed to each flower. There are three species of *Ladies Mantle*. 1. The Common, 2. The Alpine, and 3. The Five-leaved. The first is known by its simple, -lobate leaves, nicely serrated about the edge, and divided into from eight to twelve greater parts: be-

^b Students in Botany who live in or near London, or come occasionally to the great city, will be happy to profit by Mr. Curtis's excellent garden, at Lambeth, where so great a number of plants is arranged and named, so that he that runs may read.

1. *Alchemilla vulgaris*. *Lin. Mor. hist. f. 2. t. 20. f. 1.*
Mill. fig. pl. 18. 2. *Alchemilla alpina*. *Lin.*

3. *A. pentaphyllea* *Lin.*

fore the leaf expands it is folded or plaited at each of these divisions; and hence the name. The flowers grow in bunches, are inconsiderable in point of size, and also of colour, for having no corol they are only green, or what botanists call herbaceous. It is an humble, but an elegant plant, and grows in high pastures, but not common.

Alpine Ladies Mantle is much more elegant than this, with its shining silky leaves, which are digitate, and indented at the end: the folioles or component leaves vary in number from five to nine. The third species is very uncommon: it is a small plant, quite smooth, with digitate leaves, but each of its five folioles divided half way into several smaller ones.

The second order of this class has a singular plant, *Cuscuta* or *Dodder*. It is without leaves, has a stalk slender as a thread, which would trail along the ground did it not lay hold on some plant stronger than itself for support; not content with support, where it lays hold, there it draws its nourishment; and, at length, in gratitude for all this, strangles its entertainer. I imagine this account will not bespeak your affection for *Dodder*°. If you will be at the pains of disembarassing a poor suffering bean of its

° *Cuscuta Europæa* Lin. Fl. dan. 199. The divisions of the calyx, and corol, and the stamens, are sometimes five: hence some place it in the next class.

entangling

entangling stalks, you will see that the flowers come out in sessile knots; that each of these has a calyx divided half way into four parts; that the corol is of one petal divided into four segments at the edge: and that the seed-vessel is a bilocular capsule. This parasite, as Linnæus justly calls such plants, fastens itself about beans, nettles, clover, flax, &c. and feeds upon them by means of innumerable teats or glands which it inserts into the pores of its supporter's bark.

The *Pondweeds*, which are many, and sufficiently common, will serve for an instance of the third order. If your own fish-ponds are kept too clean to furnish these plants, you may probably procure them from some of your neighbours; or, if they were worth the carriage, I could send you abundance from our moat. You will know them by the leaves laying flat upon the water; and by the stem's pushing up a spike of inconsiderable flowers, that have no calyx, a corol of four deciduous petals, four germs terminated by obtuse stigmas, without the interposition of any style, and becoming in time four roundish seeds.

The *broad leaved* ^d species is one of the most common, and is known by its oblong ovate leaves. *Perfoliate Pondweed* ^e has heart-shaped leaves embracing the stalk, and grows in run-

^d Potamogeton natans. *Lin.* Miller illustr.

^e Perfoliatum. *Lin.* Fl. dan. 196.

ning waters. *Curled Pondweed* ^f has lance-shaped, waving leaves, notched about the edges, and standing alternate upon the stem: this is found both in running and stagnant waters:

But of these enough—don't hazard getting wet, or catching cold, in search of them. If any of these plants which I have hitherto recommended to your notice, elude your search, or have passed their stated time of flowering before you find them, note them down for next year: so adieu, dear cousin.

^f *Crispum* *Lin.* Curtis, Lond.

LETTER XVI.

March the 25th, 1773.

MY indisposition of last autumn has given you ample leisure, dear cousin, to make yourself mistress of the general arrangement of plants, and of the first four classes in particular. Since it is your earnest desire, I have resumed my former prate as early as possible, that nothing may escape us this season. We have now a large class to encounter with, containing more than a tenth part of the vegetable world, for it has two hundred and sixty-one genera, and one thousand five hundred and five species. It includes, as you may suppose, several natural orders, and some species are even now ready for examination.

We will open the year, by your leave, with the *Primrose*, which has its name from being one of the first flowers that blow. This, with some others that resemble it, form a natural order, entitled, for the same reason, *Præcœ*^s; and agreeing in having a monophyllous, quinquefid, permanent calyx; a monopetalous, quinquefid corol; and a capsule for a seed-vessel, superior or inclosed within the calyx. The characters of the

^s *Præcœ*, early.

genus

genus are, an involucre under the flower, or knot of flowers ; the corol funnel-shaped or falver-shaped, with the tube cylindric, and open at the top ; the stigma globose : the capsule unilocular. The species^b is distinguished by its pentagonal calyx, its cylindric oblong capsule, and the wrinkled surface, and indented edges of its leaves. The three principal varieties, if they are but varieties, are thus commodiously separated. The *Primrose*ⁱ has one flower on a naked stem, and the corol falver-shaped. The *Oxslip*^k has several flowers on one naked stem, and the corol falver-shaped. The *Cowslip*^l has many flowers on a naked stem, and the corol funnel-shaped. The yellow of the two first is very pale ; the corol of the *Primrose* is much the largest ; that of the *Oxslip* a middle size, between the two others : the simple unbranched flowering stem of the *Primrose* is weak, and rather a peduncle than a stalk ; the scape of the *Oxslip* is sometimes near a foot high, and strong ; that of the *Cowslip* is generally lower and weaker. I do not know whether I dare to tell you that all the beautiful sorts of *Polyanthus*, by you prized so much, are but an accidental vari-

^b Comprehending *Primrose*, *Oxslip*, *Cowslip*, and *Polyanthus*.

ⁱ *Primula acaulis* *Lin.* vulgaris *Hudson.* Fl. dan. 194.

^k *Primula vulgaris* β. *Huds.* Fl. dan. 434.

^l *Primula veris* *Lin.* & *Huds.* Fl. dan. 433.

ety of this species, which is certainly much disposed to vary even in its wild state. Thus the Primrose has sometimes two flowers together, or changes to green, or to red, or doubles its corol; the Oxflip sometimes has very few flowers, and they nearly as large as a Primrose; and the Cowflip has frequently red flowers, then much resembling a small Polyanthus.

See now by how many steps you arrive at a knowledge of these plants. You first determine their class and order, by seeing that they have five stamens, and one pistil; having still an hundred and fifty-five genera to encounter, you next settle what subdivision of the order they range under; and finding that the corol is monopetalous, inferior, and succeeded by a vessel inclosing the seeds, you are reduced to seventy-three genera. Next you discover that they are of the natural order of *Preciæ*, which leaves you but ten genera to choose out of. You are now got within so small a compass that it cannot be very difficult to ascertain the genus, the species which are ten in number, and the subordinate varieties. I do not make all this parade, in order to enable you to discover a plant which you was perfectly acquainted with beforehand, but to shew you how you are to proceed with a plant you do not know, from this instance of one which you do.

Or you may take it thus—You have a plant in flower, which for the present we will suppose you to be unacquainted with. You first examine the stamens and pistils; and by the number of these you determine your plant to belong to the fifth class and the first order. You next consult the subdivisions of that order, and find it belonging to that which has monopetalous inferior corols, with the seeds inclosed in a vessel. Seeing farther that your plant has a monophyllous calyx cut into five segments, that the corol is also divided in the same manner: this added to the foregoing circumstances shows you that it ranges under the natural order of *Preciæ*. Here remarking an involucre under the flowers, the tube of the corol cylindric, and open at top, and the capsule unilocular or one-celled, you are assured at length that your plant is of the genus *Primula*. But finding that the leaves, instead of being wrinkled, are perfectly smooth, fleshy, and either entire, or sharply notched about the edges, you are well assured that it is a distinct species; and upon inquiry discover it to be the *Auricula*^m, the elegant, the powdered Auricula, so much esteemed by florists, and so various in the size and colours of its corol, when in a state of cultivation.

^m *Primula Auricula* Lin.

All the other plants of this natural order are pretty, if not specious. *Meadia*, per-versely altered by Linnæus to *Dodecatheon*ⁿ, is an American plant, but flowers well and early in our climate. It has a rotate or wheel-shaped corol, reflexed: the stamens sit upon the tube; and the capsule has one cell only, and is oblong. This is sufficient for the complete detection of the plant, since there is only one known species. The leaves however are smooth; the flowering stems are naked, eight or nine inches high, and sustain many flowers, each of which has a long slender peduncle, which is recurved so that the flower hangs down; the corol is of a beautiful light purple. If you have not this plant already in your garden, procure it against next spring; you will be pleased with the structure and appearance of it.

Cyclamen resembles *Meadia* in its wheel-shaped reflexed corol, but the tube is globular, and remarkably short, with the neck prominent; the stigma, which was obtuse in that, is acute in this. The seed-vessel is roundish and fleshy, inclosing several angular seeds: Linnæus calls it a berry covered with a capsular shell. There are several species or varieties of *Cyclamen*; for it is doubtful whether they are positively distinct or not. The most common^o has heart-

ⁿ Curtis's Magazine, 12. Mill. fig. pl. 174.

^o *Cyclamen Europæum* Lin.

shaped

shaped angular leaves, marked with black in the middle. The flowers appear alone, before these, rising immediately from the root: when they fall, the peduncles twist up like a screw, inclosing the germ in the centre, and lay close to the ground among the leaves, which grow very thick together, and protect them all winter. The common colour of the corol is red, but it varies to purple and white. There is one sort which has the leaves purple underneath; and another which has the veins only purple, and the upper side veined and marbled with white: the flowers white with a purple base. The Persian sort has leaves like the last in colour, but quite entire about the edges, the flowers large, pale purple with a bright red or purple base ^p. All these, and other differences, whether specific or not, make a most agreeable variety, and are very beautiful.

There are two wild plants of this natural order which I must recommend to your inspection for their beauty. They grow in the water, and therefore you must procure them by another hand.

Marsh Trefoil or *Bog-bean*^q will discover itself to you immediately by the corol being fringed all over; it is funnel-shaped, with a short tube, and the border divided beyond the middle; the colour white, and red on the

^p Miller's fig. pl. 115.

^q *Menyanthes trifoliata* Lin. Curtis, Lond. IV. 17.

outside;

outside; the stigma bifid; and the seed-vessel a capsule of one cell. The species is distinguished by its ternate leaves; whence, and from its situation, it has the name of *Marsh-trefoil*, and because each of the component leaves is of the size and shape of a bean-leaf, it is also called *Bog-bean*. The flowers grow in a loose spike at the top of the stem.

Water Violet has a salver-shaped corol not fringed, the tube longer than in the last, the colour white or faint purple, with a yellow eye: the stamens are placed upon the tube of the corol; the stigma globose; and the seed-vessel a capsule of one cell, as in the last. The leaves are wholly immersed in the water, and finely pinnate; the flower-stem is naked, and rises five or six inches above water; towards the top are two or three whorls of flowers, and it is terminated with a cluster of them; the whole forming a kind of conical spike.

Another natural order of this class contains the plants entitled *Asperifolia* or *rough-leaved*. These are not so beautiful as the last; but you are by this time become too good a naturalist to be led away by gaudy colours or specious appearances. Though roughness of the leaves and stem is a general character of this order, yet it is more necessary that the following character should be

* *Hottonia palustris* Lin. Curtis, Lond. I. 11.

found in the fructification. The calyx is of one leaf divided into five segments, and permanent: the corol is monopetalous, divided also into five segments, tubulous, and extending below the germs: the five stamens grow from the tube of the corol: and there are four naked seeds to which the calyx serves as a capsule. We may remark farther, that the leaves are placed alternately, or without order on the stem; and that the spike of flowers, before they open, is reflexed. With so ample a train of circumstances to direct you, there cannot be much difficulty in knowing when you meet with one of this rough-leaved tribe of plants; especially as they wear the same dress, and have a strong family likeness.

Out of eighty-three species, which this order contains, you may perhaps know some of the following, and from them you will have an idea of the rest. Heliotrope or Turnsole, Mouse-ear Scorpion-grass, Gromwell, Alkanet, Hound's-tongue, Pulmonaria, Comfrey, Cerinthe, Borage, Bugloss, and Viper's Bugloss. If you examine the corol of these plants, you will observe that some of them have five scales in the tube of it, whilst others have none; this circumstance, together with the shape of the corol, will furnish the principal generic distinctions. Thus Gromwell, Pulmonaria, Cerinthe, and Viper's Bugloss have the tube of the corol

2

naked;

naked; the rest have the five scales. Heliotrope and Mouse-ear Scorpion-grass have salver-shaped flowers; Gromwell, Alkanet, Hound's-tongue, Pulmonaria, and Bugloss, have funnel-shaped flowers; in Comfrey and Cerinthe the corol is ventricose, swells or bulges out towards the top; Borage has a rotate corol; and in Viper's-Bugloss it is an irregular kind of bell-shaped corol. Heliotrope has the scales; but the top of the tube is not closed by them, as it is in the Mouse-ear Scorpion-grass, Alkanet, Hound's-tongue, Comfrey, Borage. Hound's-tongue has flat seeds fixed to their style by their inner side only. Pulmonaria has a pentagonal or prismatic calyx. Cerinthe has only too hard, shining bilocular seeds. Bugloss has the tube of the corol bent.

Common Turnsole ^s has the leaves ovate, entire, wrinkled, and covered with a nap; the lower spikes of flowers are single, and the upper ones double. The colour of the corol white, with a greenish eye, and sometimes light red. This is an annual plant.

Peruvian Turnsole† has a shrubby stem; the leaves of a long ovate form, wrinkled and rough, on short petioles; the flowers are produced at the end of the branches in short spikes, growing on clusters, the peduncles

• *Heliotropium Europæum* *Lin.*

^t *Heliotropium Peruvianum* *Lin.* Mill. fig. pl. 144.

divide into two or three others, and these again into smaller ones, each sustaining a spike of pale blue flowers, which have a peculiar odour.

Mouse-ear Scorpion-grass ^u is common both in dry pastures and heaths, and by the sides of ditches and streams; in the former it is hairy, in the latter smooth, with the flowers much larger, and extremely beautiful when seen sufficiently near, of a most elegant blue with a yellow eye. Linnæus distinguishes this species by the smoothness of the seeds, and by the tips of the leaves being callous.

There are two sorts of Gromwell wild. The *true* Gromwell ^w, which name is a corruption from *Gray Millet*, is not very common; it affects dry soils, especially chalk, and is found chiefly in woody places, or among bushes. You will know it by its whitish, shining, oval, hard seeds; which latter quality gave occasion to the Latin name, from the Greek, *Lithospermum* ^u. Or if it is not far enough advanced to show the seeds, observe that it is a much larger and more branching plant than the next; the leaves are lance-shaped; the flowers are small, and come out single from the *axæ* of the leaves

^u *Myosotis scorpioides* Lin. Curtis, Lond. III. 13.

^w *Lithospermum officinale* Lin. Mor. hist. f. 11. t. 31. f. 1. Ger. 609.

^w Stone-feed.

on short peduncles; the corol is white or yellowish, with a greenish tube.

Corn Gromwell ^x is a common weed among corn, and differs from the former in its wrinkled, conical seeds; the leaves also are ovate, and sharp-pointed; the flowers are chiefly on the top of the stem among the leaves; the corol is white, with the tube swelling at top. Both species have the corols scarcely extending beyond the segments of the calyx; and both have the roots tinged with red, whence the latter has the name of *Bastard Alkanet*.

Hound's-tongue ^y is a large plant that grows common by the hedges and way sides; it has a strong smell like that of mice in a trap. The corol is of a dirty red, or the colour of blood that has stood some time. It is distinguished from the other species by the stamens being shorter than the corol; the leaves broad lance-shaped, nappy, and sitting close to the stem without petioles.

Comfrey ^z is common by water sides. The leaves are large, long, hairy, and ending in a point; from their base on each side runs a border down the stalk*. From the upper part of the stalk come out some side-

^x *Lithospermum arvense* *Lin.* Fl. dan. 456. Mor. f. 7. Ger. 610.

^y *Cynoglossum officinale* *Lin.* Curtis, Lond. IV. 16.

^z *Symphytum officinale* *Linnæi.* Curtis, Lond. IV. 18.

* This is what *Linnæus* calls *decurrent*.

branches, with two smaller leaves, terminated by loose bunches of nodding flowers; the corol of a yellowish white, in some places purple.

Of *Cerintbe* there are two species only, distinguished by the larger sort* having obtuse, open corols; the less^a having sharp, close corols. The leaves of the first are sea-green spotted with white; it varies with prickly and smooth leaves, with yellow and purplish red corols. It grows wild in Italy, the south of France, Germany, and Swisserland. The second has more slender stalks; the calyx large, the corol small and yellow. This is found naturally in the Alps. Both are not uncommon in gardens.

Borage^b is an annual plant, which comes up in your kitchen garden, without the care of the gardener. The whole plant is rough; the leaves are large, and broad lance-shaped. The flowers come out in loose, naked bunches, on long peduncles, at the end of the stalks: the calyx, with the corol spreads out quite flat; the colour of the corol is a fine blue, which sometimes fades to white, or changes to red.

Bugloss^c is common among corn, and by way sides. Is a very rough plant, with blue corols veined with white.

* *Cerintbe major* Lin. Mill. fig. 91.

^a *Cerintbe minor* Lin. *and* *clausula* *mutabilis*

^b *Borago officinalis* Lin. Mor. hist. f. 11. t. 26. f. 1. Ger. 797.

^c *Lycopsis arvensis* Lin. Fl. dan. 435. Ger. 799.

Viper's Bugloss^d is a much larger plant than this, with a large handsome spike of blue flowers. The stalk is very erect and spotted: the leaves lance-shaped, the lower ones petiolate, the upper ones sessile. It is common among the corn in some countries; also in some pastures, by way-sides, and on walls.

You will find some plants of this fifth class and first order which have a bell-shaped corol of one petal. If they have a permanent calyx divided into five parts, and a capsule for a seed-vessel, they belong to a natural order entitled *Campanaceæ*^e. Three very large genera^f, besides some others, belong to this order.

The genus *Convolvulus*^g is distinguished from all others by its large, spreading, plaited corol, with the edge either marked with ten notches, or slightly quinquefid; two stigmas; and a capsule wrapped up in the calyx, generally bilocular, with two roundish seeds.

From this genus I will select two wild

^d *Echium vulgare* Lin. Fl. dan. 445. Ger. 802.

^e Bell-flowers.

^f *Convolvulus*, *Ipomæa*, and *Campanula*: the first has sixty-four; the second twenty-two; and the third sixty-six species.

^g So called from twining round any thing it comes near; this property however is not common to all the species.

and two cultivated species, for your examination.

Small Bindweed^h, which is so common a weed among corn, has sagittate leavesⁱ acute both ways, and one flower upon a round long peduncle. The weak stalks trail on the ground, unless they meet with some other plant to support them; the corol is either white, or red, or variegated; and if the plant came from India it would be cultivated for the beauty of the flower: I do not however recommend you to grow fond of it, for it creeps intolerably at the root.

Great Bindweed^k has sagittate leaves as well as the last, but truncate or cut off behind; the flowers come out single also, but on square peduncles. This is a much larger, stronger plant than the other, rising in hedges or among bushes and shrubs, ten or twelve feet high: the corol is very large and always pure white; immediately under the calyx is a large heart-shaped involucre of two leaves. The former species has these two leaves, but they are very narrow, and in the middle of the peduncle.

Purple Bindweed^l, an annual species cultivated in flower gardens under the name of

^h *Convolvulus arvensis* *Lin.* Curtis, Lond. II. 13.

ⁱ Shaped like the head of an arrow.

^k *Convolvulus sepium* *Lin.* Curtis, Lond. I. 13.

^l *Convolvulus purpureus* *Lin.* Ehret. pict. t. 7. f. 2.

Convolvulus major, has heart-shaped undivided leaves, the seed vessels hanging down after the flower is gone, and the peduncles swelling. This if supported will climb to the height of ten or twelve feet. Though the most usual colour of the corol is purple, yet there are varieties white, red, and whitish blue.

Tricolor Bindweed ^m, or as it is vulgarly called, *Convolvulus minor*, has lance-shaped, smooth leaves, a weak falling stalk, that never climbs, and the flower coming out singly. The corol is a beautiful blue with a white eye; but sometimes all white or variegated. This is also annual. Its native country is Portugal. The former is wild both in Asia and America.

This genus contains several remarkable plants; as *Scammony* ⁿ, *Turpethum* or *Turbith*, and *Jalap*.

Ipomœa has rather a funnel-shaped than a campanulate corol; a globose stigma, and a trilocular capsule*; but the plants that range under this genus being natives of the West Indies, and consequently requiring much heat to raise and preserve them, may probably not come within your view; and therefore I shall not enlarge upon them.

^m *Convolvulus tricolor* Lin.

ⁿ *Conv. Scammonia*. Lin. Mill. fig. 102.

* See Mill. fig. 214.

In *Campanula* you will of course expect to find a campanulate or bell-shaped corol: but it is worth your observation that the bottom of it is closed with five valves, concealing the receptacle, and that the stamens take their rise from these valves. The stigma is trifid. And the seed vessel is a capsule, below the flower, having three or five cells, and at the top of each a hole, through which the seeds are scattered when ripe. You see by this time how curious and how various the structure of the parts of fructification is. By thus examining them singly, and comparing them one with another, you will in time grow an eminent botanist, and acquire a facility in determining the genus, species, analogy and connexion of vegetables.

There is a little *Bell-flower* that grows frequent in dry pastures, and on almost every heath and common, with its nodding blue corol answering well to its name. The botanists have conspired to call it *round-leaved Bell-flower* °; for what reason perhaps you will wonder, since you will discover no leaves upon the stem but what are linear, or very long, narrow lance-shaped: if however you take a young plant, or at least one in full vigour, and search among the grass close to the ground, you will see these leaves, which are not so properly round as heart ° or kidney shaped*. This sort flowers the

° *Campanula rotundifolia* Linnæi. Curtis, Lond. IV. 21.

° Haller.

* Linnæus.

latter part of the summer, and all the autumn, till frost puts an end to it; and frequently has a white corol. *Rampion*^p, which was formerly cultivated for its roots to eat in fallads, is now so much neglected, that your kitchen garden perhaps may not furnish it; and in its wild state it is by no means common. This has upright stalks, two feet high; the leaves undulating, those next the root short, lance-shaped, inclining to oval: towards the upper part of the stem, and close to it, small bell flowers are produced, with a blue or white corol.

Peach-leaved Bell-flower^q is abundant in your flower borders, both blue and white; but since your gardener has obtained the double sorts, he has probably despised the single ones so much as to have destroyed them, and at the same time to have deprived you of the power of determining the genus: you will however know this to be a *Campanula* by its air; and you will determine the species by the leaves, which are ovate near the root, and on the stalk are very narrow lanced-shaped approaching to linear, slightly serrated about the edge, sit close to the stem, and are remote from each other.

I remember your hall chimney used to be adorned in summer with the *pyramidal* or

^p *Campanula Rapunculus Linnæi.*

^q *Campanula Persicifolia Linnæi.*

steeple Bell-flower^r, strutting out like a fan, by means of a frame or little sticks. This has smooth, heart-shaped leaves, serrated about the edge; those on the stem lance-shaped: the stems are simple and rush-like: the flowers come out in sessile umbels from the side of the stem. Such are Linnæus's specific characters.

There is the *Giant Throatwort*^s, wild, but not common, in bushy places and hedges: known by its strong, round, single stalks; its long ovate leaves, inclined to lance-shaped, slightly serrated or toothed like a saw on their edges: towards the upper part of the stalk the flowers come out singly upon short peduncles. Pray remark, that after these are faded the seed-vessels turn downwards till the seeds are ripe, and then rise up again.

Great Bell-flower^t, vulgarly called *Canterbury Bells*, is much more common in the like places. This has stiff, hairy, angular stalks, putting out a few short side-branches. The leaves are like those of nettles, hairy, and deeply serrated on their edges: towards the upper part of the stalks, the flowers come out on short trifid peduncles, and have hairy calyxes.

^r *Campanula pyramidalis* Linnæi.

^s *Campanula latifolia* Lin. Fl. dan. 85. Ger. 448.

^t *Campanula Trachelium* Lin. Mor. hist. f. 5. t. 3. f. 28. Ger. 448.

Small Canterbury Bells^u is common in pastures, especially in a chalky soil. In dry places it is very small, and in a moist soil will grow to the height of two feet. The stalk is hairy, angulate, and unbranched; the lower leaves are broad, and pedunculate; those on the stalk long, narrow, sitting close to the stalk, and even embracing it: towards the top of the stalk, from the *axæ* of the leaves, two or three flowers come out together, and a larger bunch terminates it: the flowers are sessile.

Venus's Looking-glass^v is a Campanula, with a weak, low and very branching stalk; the leaves oblong, and a little notched; the flowers solitary, and the seed-vessels of a prismatic form. *Corn-bell-flower*^w very much resembles this; but the stalk is stiff, and branches little; the leaves are more deeply notched, and waving; the flowers come out in parcels, and the calyx is longer than the corol. This is a common weed among corn. These two have scarcely bell-shaped corols, any more than another plant of this Campanulate order, entitled *Greek Valerian* or *Jacob's Ladder*^x, which has the corol rather

^u Campanula glomerata Linnæi. Mor. t. 4. f. 43. Ger. 449.

^v Campanula speculum Lin.

^w Campanula hybrida Lin. Mor. t. 2. f. 22. Ger 439.

^x Polemonium cæruleum Lin. Fl. dan. 255. Ger. 1076.

rotate,

rotate, with the tube shorter than the calyx, but closed with five valves, into which the stamens are inserted, as in *Campanula*: the stigma also is trifid, as in that, and the seed-vessel a trilocular or three-celled capsule, but inclosed within the flower. The circumstances that distinguish this from the other two species are, that the leaves are pinnate, the flowers erect, and the calyx full as long as the tube of the corol; in which you see it recedes a little from one character of the genus. It is blue, and cut into five roundish segments. I scarcely need caution you not to be misled by names, which being usually given by ignorant persons, are very fanciful or erroneous. Thus here, you may as well suppose *Polemonium* to have an affinity with a ladder as with valerian: indeed the same circumstance of the pinnate leaves probably gave occasion to both names.

I am almost afraid to present you with a set of plants, which from their lurid, dusky, dismal, gloomy, appearance, are kept together under the title of *Luridæ*. They have also most of them a disagreeable smell, which, with their forbidding look, will deter our young cousin from examining them, she not being yet sufficiently tinctured with enthusiasm to go on in spite of such circumstances. Indeed I would not wish her to be too busy with some of these *insane roots that take the reason prisoner*,

prisoner, and which I can never collect and examine myself, without their affecting my head. You will consider that nature has kindly given us notice in general of approaching danger, by means of our senses; and accordingly some of these *lurid* plants are highly poisonous; most of them are so in some degree, though soil and climate may mitigate the poison, and even render them wholesome. I will select some of the least disagreeable in smell and appearance; or if they are otherwise, will announce it to you. Besides the circumstances of five stamens and one pistil, these plants agree in a permanent calyx, divided more or less deeply into five segments; a monopetalous corol divided also into five segments, tubulous, irregular; the seed-vessel bilocular, and either a capsule or a berry, inclosed within the flower.

Of *Verbascum*, or *Mullein*, there are several species wild, one very common, and another not uncommon. Their general characters are, that the corol is rotate, and slightly irregular; the stamens unequal in length, bending down, and generally clothed at bottom with a coloured fringe; the stigma obtuse, and the capsule bivalve, and opening at top.

The common species is the *Great* or *Hoary Mullein*^y, which grows mostly under

^y *Verbascum Thapsus Linnæi*. Fl. dan. 631. Mor. hist. f. 5. t. 9. f. 1. Ger. 773.

banks or hedges. It is a biennial plant; the first year forming its root, and a set of large, broad leaves, extremely woolly on both sides, and spreading on the ground, with scarcely any petioles: the second year it sends up a single stem, sometimes five feet in height, with decurrent leaves on it, woolly as the radical ones; and on the top a close spike of yellow flowers, which have an odour not disagreeable.

The other which I hinted at is the *Black Mullein*², growing in similar places, abundantly in some, but by no means so extensively. It has not so high a stem; the shape of the lower leaves is that of a heart much lengthened out, and they are petiolate; the leaves on the stem ovate, sharp-pointed and sessile; all of them are pale green on the upper, and hoary on the under surface; and are indented about the edges. The stalk is terminated by a long spike of yellow flowers, formed by short clusters or *spiculæ* on the sides of the principal stalk. The corol is yellow, with the filaments fringed or bearded with purple. It has the name of black, I presume, merely because it is not white, like the other.

Datura, *Stramonium*, or *Thorn Apple*, has the calyx tubulous, swelling in the middle, five-cornered, and deciduous; the corol fun-

² *Verbascum nigrum* Lin. Mor. hist. f. 5. t. 9. f. 5.

nel-shaped, spreading out gradually very wide from a long cylindric tube, into a pentangular border with five plaits: the capsule is quadrivalve, or opens into four parts. The flowers of these are large, and rather specious, and the capsules are remarkable for their size.

The *common Thorn Apple*^a has smooth leaves, irregularly angular, and smelling disagreeably; the flowers come out from the first divisions, and near the extremities of the branches; the corol is white, and each angle of it ends in a long point; the capsule is ovate, covered with strong thorns, and grows erect.

Another sort^b, cultivated sometimes in flower gardens, has purple flowers; it has also purple stalks, which are stouter and taller than those of the last; the leaves are also larger, and more angulated and notched; the capsule is larger, but much like that of the common sort. One of them, having the capsule armed with very strong spines, has the epithet of *fierce*^c.

Henbane^d is a very common plant, and has often done mischief to such as will not suffer their appetites to be corrected by their senses. You will agree with me that the

^a *Datura Stramonium* *Lin.* Ger. 349.

^b *Datura Tatula* *Lin.*

^c *Datura ferox* *Lin.* Mor. t. 2. f. 4.

^d *Hyoscyamus niger* *Lin.* Ger. 353.

smell is sufficient to deter any person from eating it. I cannot however dispense with your examining the flower, which is really beautiful on a near view. The corol is funnel-shaped, and obtuse; of a pale yellowish colour, beautifully veined with purple. The stamens are of different lengths and bent; and the capsule is involved in the calyx, is of an oval form, and covered with a hemispherical lid, which by falling off announces that the seeds are ripe.

The common wild species is distinguished from the others by its sinuate leaves, embracing the stalk, and by the flowers sitting close to it. The whole plant is covered with long hairs, from which exudes a clammy, fetid juice; the leaves are very large, and remarkably soft; and the flowers come out in a very long spike, rather on one side. It grows on banks, dunghills, and way-sides about villages, and is a biennial plant. There are other sorts, but neither wild nor much cultivated.

You who have such an aversion from tobacco in all the ways of using it, will not be displeased at finding it in this lurid order. Notwithstanding it is so generally taken, the oil of it is the strongest of the vegetable poisons. It is a plant however neither unornamental for your garden, nor dangerous, or even disagreeable to examine. The essential generic characters are, that the
corol

corol is funnel-shaped, the border plaited; the stamens a little inclined; the stigma notched; the capsule ovate, marked with a furrow on each side, bivalve, and opening from the top.

Common or *broad-leaved Tobacco*^e is distinguished by its broad lanceolate leaves, which are about ten inches long, and three and an half broad, smooth, ending in acute points, and sitting close to the stalks; the corols are of a bright purple, and end in five acute points. There is a sort like this, or perhaps a variety of it, called *Oroonoko Tobacco*, which is a larger plant, the leaves more than a foot and half long, and a foot broad; very rough and glutinous; the base embracing the stem: the corols are of a pale purple.

Another species, called *English Tobacco*^f, might easily be mistaken for a Henbane, if you did not remark the regular form of the corol, and the want of a lid to the capsule. It is a lower plant than the others; the leaves are ovate, entire, and on short petioles. The flowers come out in loose bunches on the top of the stalks; the corol has a short tube, spreading out into five obtuse segments, of a greenish yellow colour. Though this has the epithet of English, you

^e *Nicotiana Tabacum Linnæi*. Mill. fig. 185. 1.

^f *Nicotiana rustica Linnæi*.

are not to suppose it to be an European plant, for it is a native of America, as well as all the other species, which are at least seven in number.

How the same plant should come to have the gentle appellation of *Bella-donna*, and the tremendous name of *Atropa*^s, seems strange, till we know that it was used as a wash among the Italian ladies, to take off pimples, and other excrescencies from the skin; and are told of its dreadful effects as a poison. Linnaeus has joined them, making *Atropa* the generic, and *Bella-donna* the specific or trivial title. The principal characters which he gives of the genus are these—the corol is bell-shaped; the filaments grow from the base of it, are close at bottom, but at top diverge from each other, and are arched; the seed-vessel is a globose berry, sitting on the calyx, which is large.

Our sort, for there are six species of the genus, is a great branching plant, with ovate, entire leaves, and large flowers coming out among the leaves singly, on long peduncles; the corol is of a dusky brown colour on the outside, and of a dull purple within; the stalks have a tinge of the same colour, as have also the leaves towards autumn. The berry is round, of a shining black when ripe, and not unlike a black cherry in size

^s From *Atropos*, the name of one of the furies. Figured by Miller, pl. 62.

and

and colour; it contains a purple juice of a mawkish sweetness, and has frequently enticed children to taste it at their peril. I have known however the same poisonous effects follow from eating the young shoots of the spring boiled, as from the crude berries of autumn. *Deadly Nightshade* is rarely cultivated, and not common wild; it skulks in gloomy lanes, and uncultivated places, but is too frequent near villages in some countries.

You have heard of the *Mandrake's Groan*, and “ of shrieks, like Mandrakes torn out of the earth:” superstition having endued this plant with a sort of animal life, fatal to whoever presumed to destroy it, by digging up the root. It was famous, as Opium now, for procuring sleep; whence Cleopatra calls for *Mandragora*, “ that she might sleep out the great gap of time her Antony is away.” And the vile Iago boasts that “ not Poppy, nor *Mandragora*, nor all the drowsy syrups of the world, shall ever med’cine Othello to that sweet sleep which he had yesterday.” Since Mandrake groans and shrieks when injured, it must needs have a human form; and accordingly such have been carried about for sale, notwithstanding the danger that attends the procuring it; but this is cunningly avoided by tying a dog to the root, and thus making the blind fury of the poor Mandrake fall upon the innocent

O 3

dog,

dog instead of the aggressor. These pretended Mandrakes, are said to be roots of Angelica or Bryony, either cut into form, or compelled to grow through earthen moulds put into the ground for this purpose: they were used in magical incantations; and though these are now pretty much out of fashion, yet I have had them very gravely offered me for sale. Linnæus formerly made this a distinct genus from the last, but on second thoughts he has made it a species of *Atropa*^h, distinguishing it from the others, by its having no stems except the scapes which support a single flower. The root is like that of a Parsnep, sometimes forked; next the ground there is a circle of large, broad leaves; the *scapes* or naked stalks that support the flowers, are but about three inches long; the corols are five cornered, and of a greenish white or purplish colour; the berry is as large as a nutmeg, and of a yellowish green. The root and leaves are stinking, and the whole plant is poisonous, though, in small doses, it is used medicinally.

Another genus of this same natural order is *Physalis*; the characters of it are these—the corol is wheel-shaped; the filaments and anthers are connivent or bend towards each other; and the seed vessel is a berry inclosed

^h *Atropa Mandragora*. Mill. fig. pl. 173.

within

within the calyx, which grows to a large inflated, coloured bladder. *Winter-Cherry*¹, of which you have such abundance under your shrubs, is a species of this genus. The distinguishing marks are, that the leaves are double or conjugate, that is, come out in pairs, are entire about the edges, or but very slightly indented, and sharp pointed; the stalk is herbaceous, and a little branching at bottom. The roots creep so far as to be troublesome; the stalks are only about a foot high; the leaves are of various shapes, and have long petioles: the flowers are produced singly from the *axæ* of the stalks on slender peduncles; and have a white corol, which, with the calyx, leaves and stalks are hairy. This plant, which is so humble and inconsiderable all the summer, attracts your notice in autumn, by its great inflated calyx turning red, and disclosing the round red berry within it, about the size of a small cherry.

But the principal genus of this natural order is the *Nightshade*, or *Solanum*, whence some authors have entitled these plants *Solanaceæ*. There are no less than forty-six species of them; of which I shall select, as usual, both some wild and cultivated sorts, such especially as are either most important, or most likely to be within your reach.

¹ *Physalis Alkekengi*.

You will easily know the genus by its wheel-shaped corol; by its large anthers closed in the middle of the corol, and seeming to form but one body; and by its bilocular berry.

Some of the species have prickly stalks and leaves; others are unarmed: hence a commodious partition of the genus into two subdivisions.

A shrubby, tall sort, from the Madeiras, without any spines or prickles, has long been an inhabitant of the green house, which it adorns with its splendid red berries all the winter; the gardeners know it by the name of *Amomum Plinii*; and it is often called *Winter Cherry*^k; such is the dearth of distinctive names, and such the confusion arising from the want of a regular language, like that which Linnæus first introduced into Botany. The leaves are lance-shaped, and have a waying edge^l: the flowers grow in small umbels, close to the branches; the corol is white; and the berries are as large as a small cherry; generally red, but sometimes yellow.

Another shrubby sort, without spines, is the *Woody Nightshade*, or *Bitter-sweet*^m, which grows commonly wild in moist hedges.

^k *Solanum Pseudocapsicum* Lin.

^l Linnæus calls them repand.

^m *Solanum Dulcamara* Lin. Curtis, Lond. I. 14.

This has a climbing, flexuous stalk: the lower leaves lance-shaped, the upper ones sometimes trifid: the flowers are in bunches, or branched cymes, coming out from the *axæ* of the leaves; the corol revolute, purple, marked with two shining green spots at the bottom of each segment; and the berries red..

Garden Nightshade ⁿ, is also unarmed, but not shrubby. It is an herb, and annual. The leaves are on long petioles, and being of a soft texture, are inclined to hang down. They are of an ovate or rhomboid form, with long points, angulate and notched about the edges: the flowers grow on a kind of nodding umbel; the corol is white, and the berry is black. It is a common weed on dunghills, in gardens, and other richly cultivated places. It varies with yellow and red berries; and in the form of the leaves.

Potatoe ^o is of this genus, as you will be convinced, if you compare the structure of the flower, with that of the other species. Linnæus characterises it by these distinctions—that the stalk is herbaceous and unarmed, the leaves pinnate and quite entire, the peduncles subdivided: the corols are either purple or white, and the berry is large.

ⁿ *Solanum nigrum* Lin. Curtis, Lond. II. 14.

^o *Solanum tuberosum* Lin. The English name is evidently a corruption of the Indian *Batatas*.

Tomatos

Tomatos or *Love-apple* ^p is another species of Nightshade, which is also admitted to the table, and eaten with impunity, in spite of the ill neighbourhood in which it is found. This has an unarmed, herbaceous stem, which is very hairy; the leaves also are pinnate, but cut; and the flowers are born on simple unbranched bunches; the corol is yellow, and the fruit or berry is large, flatted, and deeply furrowed.

Melongena or *Mad Apple* ^q is also of this genus; it is cultivated as a curiosity for the largeness and shape of its fruit; and when this is white, it has the name of *Egg plant*; and indeed it then perfectly resembles a hen's egg in size, shape and colour. The stem of this is herbaceous, and without prickles; the leaves ovate and nappy; the peduncles pendulous, and growing thicker towards the top, and the calyxes unarmed. The corols are purple, and the fruit varies much in colour. The three last species recede a little from the character of the order; for the Potatoe and Tomatos have many cells to the fruit, and this has but one.

The prickly sorts of *Solanum* are natives of hot countries, and most of them are brought to us from the Spanish West Indies: they will not therefore commonly fall under your observation.

^p *Solanum Lycopersicum* Lin.

^q *Solanum Melongena* Lin.

Capficum, or *Guinea Pepper* is alfo of this lurid order; its beauty and ufe lies in the fruit, which Linnæus calls a dry or juicelefs berry, and others a capfule or pod. This circumftance, together with the rotate form of the corol, and the anthers being connivent, make up the effential characters of the genus, Linnæus has only five fpecies, one annual^r, with an herbaceous ftem, the reft perennial with woody ftems^s. Others make many more fpecies from the different form of the fruit; which indeed varies much both in fhape and colour, and intermixt with the white flowers and green leaves, makes a pleafing variety: but Linnæus does not allow the form of the fruit in this genus to be permanent enough to conftitute fpecific differences. They are all very hot, and hence have the names of *Bell Pepper*, *Hen Pepper*, *Barberry Pepper*, and *Bird Pepper*. The *Bell Pepper*, which has large, fwelling, wrinkled fruit, with a flefhy tender fkin, of a red colour when ripe, is the only fort fit for pickling. *Cayan Pepper* is made from the laft, whose fruit is fmall, oval, of a bright red, and much more pungent than the reft. Moft forts of *Capficum* come from both Eaft and Weft Indies. Though they are ufed in hot countries fo univerfally with their food, yet

^r *Capficum annuum*.

^s *Capficum baccatum*, *finenfe*, *groffum* & *frutefcens*.

the ripe fruits thrown on the fire will emit strong noisome vapours, which occasion violent sneezing, coughing, and often vomiting, in those who are near; and mixt in snuff will have the same effects to a violent and dangerous degree: so that these plants, though not strictly poisonous, are however worthy a place in the lurid tribe.

In this first order of the fifth class are to be found several well known shrubs; among which the *Honey-suckle* is eminent. Of these the *Italian*^t, and *Wild*^u species are the principal. They are distinguished by the first having the upper pairs of leaves connate, or so joined as to form but one, and the stalk running through the middle of them: whereas in the wild *Honey-suckle* they are all distinct. The Dutch or German *Honey-suckle* of the gardens is supposed to be a variety only of this, though it is much stronger, and not so apt to climb. The *Woodbind* has indeed very slender trailing branches, twining round the boughs of trees, and climbing to the very tops of them.

Trumpet Honey-suckle^v is a North American; it agrees with the *Italian* in having the upper leaves connate; with the *Woodbind* in its slender trailing branches: but differs from

^t *Lonicera Caprifolium* *Linnaei*. Hort. angl. t. 5.

^u *Lonicera Periclymenum* *Lin.* *Woodbind*. Curtis, Lond. t. 15.

^v *Lonicera sempervirens* *Lin.* Riv. mon. 116.

both

both in the whorls of flowers being naked or void of leaves, and the corols being almost regular; the leaves also are evergreen, and the corols are bright scarlet on the outside, and yellow within.

There are other species, which you will find among the shrubs, differing in appearance, and receding something in character, from Honey-suckles properly so called. These have always two flowers only coming out together; whereas in the former the flowers grow in whorls or heads many together. *Fly Honey-suckle*^w has the two berries that succeed the two neighbouring flowers distinct; the leaves are entire and hoary; and the corols are white. *Red-berried upright Honey-suckle*^x has the two berries joined together; the leaves lance-shaped and smooth; the corols are red on the outside, but pale within. This is not so tall growing a plant as the other.

The five recited species agree in having a monopetalous irregular corol, except that in the Trumpet Honey-suckle it is almost regular; in the genuine Honey-suckles the tube is remarkably long. The seed-vessel in all is a berry growing below the flower, and inclosing several seeds; though the last has only two.

^w *Lonicera Xylosteum* Lin. Mill. fig. 167. 1.

^x *Lonicera alpigena* Lin. Mill. fig. 167. 2.

The numerous genus of *Rhamnus*, containing twenty-seven species, is also of the first order in the class *Pentandria*: these are either thorny, prickly, or unarmed. *Buckthorn* ^y is one of the first; having thorns terminating the branches, the stem erect, the leaves ovate, and the calyx cut into four segments: the berries have four seeds in them, and if you wet them and rub them on white paper, they will stain it of a green colour. I mention these two circumstances, because they who gather the berries for sale are apt to mix others with them; and I know you will be interested in them, when I inform you, that the fine green colour ^z, which you use in your miniature painting, is made from these berries. If you should have the curiosity to search the hedges for them, in order to make this paint yourself, you must not be surprised if you do not find them on every Buckthorn shrub; for all the flowers are incomplete, some plants having them with stamens, others with a pistil only; and the former of these are never succeeded by fruit.

Berry-bearing Alder ^a is one of the unarmed species. It grows in woods, is a black looking shrub, with bunches of inconsiderable

^y *Rhamnus catharticus* *Lin.* Fl. dan. 850. Duham. 50. Ger. 1337.

^z Verd de vessie.

^a *Rhamnus Frangula* *Lin.* Fl. dan. 278. Duham. 100. Ger. 1469.

herbaceous

herbaceous flowers, with a quinquefid corol, succeeded by black berries containing four seeds: the leaves are ovate, smooth, and quite entire.

Another of the unarmed division is the *Alaternus*^b, formerly so shorn and beclipped in hedges, and covering of walls; but now seen chiefly among other evergreens, taking its natural form. The leaves are extremely shining, generally notched or serrate about the edges: the flowers have a trifid stigma, and are incomplete, like those of the Buckthorn: the corol is quinquefid, and the berry has three seeds. There are several varieties of *Alaternus*, differing in the shape of the leaves, and depth of the serratures; they are also sometimes blotched or variegated. This shrub is frequently confounded with *Philyrea*, from which it may be known at all times by the position of the leaves, which is alternate in this, and opposite in that: when the two shrubs are in flower, you perceive other more essential distinctions.

Paliurus or *Christ's-thorn*^c is one of the prickly division. It has double prickles, the under ones reflexed; and is another instance of irregularity in this genus, the germ being trilocular, surrounded by a membranaceous

^b *Rhamnus Alaternus* Lin.

^c *Rhamnus Paliurus* Lin.

rim, and crowned by three styles. It has a pliant weak stem requiring some support; the flowers grow in clusters, and are of a greenish yellow colour: the corols are quinquefid. Being very common in Palestine, it is supposed to be the thorn with which our Saviour was crowned.

The common character of all these is, that there is only a calyx or corol, with five small scales, one at the base of each division, bending towards one another, and defending the stamens; the seed-vessel a roundish berry, divided within into fewer parts than the corol or calyx.

Currants and Gooseberries^d, the Ivy^e and the Vine^f, are also of this order *Monogynia*; but being so well known to you and every body, I will not dwell on them, having already run out this letter to so great a length.

Some other trees and shrubs are less known, because they are the growth of hotter climes. Such is the coffee^g, originally of Arabia, though now common in both the Indies. It is known by its salver-shaped corol, with the stamens growing upon the tube of it; and by its seed-vessel, which is a berry, below the flower, containing two seeds, covered with

^d Ribes *Linnaei*.

^e Hedera Helix *Lin.*

^f Vitis vinifera *Lin.*

^g Coffea Arabica *Linnaei*.

an *aril*, or detached coat. This tree does not grow above sixteen or eighteen feet high; the leaves are large, of a lucid green, lance-shaped, and waving about the edges. The flowers are produced in clusters, close to the branches; the corols are quinquefid, of a pure white colour, and a very grateful odour. It is an evergreen, and at all times makes a beautiful appearance.

Cestrum or *Bastard Jasmine* is a shrub of the West Indies, and therefore requires a stove to keep it alive in these northern countries. It has a funnel-shaped corol; the filaments have a little process in the middle; and the seed-vessel is an unilocular berry, containing several seeds. One species^b, has clusters of herbaceous flowers on short peduncles, smelling sweetly in the night. And anotherⁱ, with leaves of a lively green, and great consistence, has clusters of white flowers, sitting close to the stalk, smelling sweet in the day time.

Diosma is a genus of shrubs from the Cape of Good Hope. These are of another phalanx, having five petals to the corol, which is inferior, or incloses the seed-vessel. The germ also is crowned with five nectaries, and becomes three or five united capsules, con-

^b *Cestrum nocturnum* *Lin.* Dill. elth. t. 153. f. 185.

ⁱ *Cestrum diurnum* *Lin.* Dill. elth. t. 154. f. 186.

taining each one seed, with an elastic *aril* involving it. The flowers are small, but elegant; white, and of an agreeable spicy odour.

Other foreign trees and shrubs of this class and order are, the *Iron-wood tree*^k, the *Phyllis*, the *Mango-tree*^l, and some others: but since it is not probable that you will meet with these, I have not troubled you with their characters, or any account of them.

There remain some specious plants to be noticed, which are commonly cultivated in flower gardens for their beauty. Such are all the species of *Lychnidea*^m: which you will know by their salver-shaped corol, with a bent tube; their filaments of unequal length; their trifid stigma; their prismatic calyx; their three-celled capsule, with one seed in each cell. They are perennial plants; the corols of most of the species are large, and of a purple colour; and the leaves are lance-shaped. They are the produce of North America.

Upon the first discovery of the New World, as America was vauntingly called, every thing found there was represented as wonderful. Strange stories were related of the plants and animals they met with, and those

^k *Sideroxylon*.

^l *Mangifera Indica* *Lin.*

^m *Phlox Linnei*. See *Mill* fig. 205.

which

which were sent to Europe had pompous names given them. One of these is the *Marvel of Peru*, the only wonder of which is the variety of colours in the flower. It appertains to this class and order, and has the following generic marks—the corol is funnel-shaped, the stigma globose; and there is a globose nectary inclosing the germ, which afterwards hardens to a kind of nut. There are three species: first, the common *Marvel of Peru*^a, which has so much variety of colour in the flowers of the same plant; these are produced plentifully at the ends of the branches, and in hot weather do not open till towards evening; but when it is cool covered weather, continue open the greatest part of the day. Secondly, that whose root was supposed, though erroneously, to yield the *Jalap*^o; the stalks of this are swollen at the joints, the leaves are smaller, and the flowers sit singly, close in the *axæ* of the leaves: they are not variable, but all of a purplish red, and not much more than half the size of the others: the fruit also is very rough. In the West Indian islands, where it is very common, they call it *four o'clock flower*. Thirdly, the *long-flowered Marvel of Peru*^p, whose corols are white, and have remarkably

^a *Mirabilis Jalapa Lin.*

Mirabilis dichotoma Lin. Mart. cent. t. 1.

^p *Mirabilis longiflora Lin.*

long tubes ; they have a musky odour, and keep close shut all the day, expanding as the sun declines : they grow in bunches like the first sort, and the seeds are rough like the second : this differs from both the others in having weak stalks that require some support ; and these, with the leaves, are hairy and viscous. This species is from Mexico, and has not been long known.

The *Crested Amaranth* belongs also to this place ; it is commonly called *Cock's-comb*, from the form in which the head of flowers grows. It ranges in the division of incomplete, inferior flowers : and the generic characters are—that the exterior calyx consists of three dry, coloured leaves, within which is a corol or second calyx, consisting of five stiff, sharp-pointed leaves : that there is a small rim surrounding the germ, from which the filaments take their rise ; and that the seed-vessel is a round capsule, opening horizontally, and containing three seeds.

There are many species ; but that which is so much esteemed for the variety of form and colours in its fine crest of flowers, is distinguished by oblong ovate leaves ; round, striated peduncles ; and oblong spikes^a. The colours are red, purple, yellow, white, and variegated ; and some are like a fine plume of scarlet feathers. You must not however

^a *Celosia cristata* Lin.

confound these plants with the *Amaranth* or *Prince's Feather*, which you will find in a place far distant from this.

One natural order more shall, if you please, conclude your labours, and my prate, for the present. It has its name^r from this circumstance of the divisions of the corol being turned or bending in the same direction with the apparent motion of the sun. But besides this singularity, the flowers of this order have a one-leaved calyx divided into five segments; a corol of one petal; and a fruit consisting of two vessels, containing many seeds. In most of the *genera* these fruits are *follicles*^s. The corols in the greater part are *funnel-shaped*; and are furnished with a remarkable *nectary*.

The common Periwinkle, which covers the ground and creeps about the bottoms of the hedges, in many parts of your plantations, may serve you very well for an example of this order. It has a salver-shaped corol, succeeded by two erect follicles which contain seeds that are called naked or simple, to distinguish them from those of some other genera, which are winged. You will observe also that the tube of the corol forms

^r Contortæ *Lin.*

• This is a dry seed-vessel, of one cell and one valve; the seeds lie loose in a down, and the shell opens on one side to let them escape.

P 3 a pentagon,

a pentagon at top; nor will it escape you, that there are two large stigmas, one over the other.

. Linnæus will not allow that the little running sort^t, and the upright one with larger flowers^u, are distinct species. Without entering into any controversy on a matter not easy to settle; you know them asunder not only by their size, but by the stalks of the first lying on the ground, and the leaves being narrower, and sharp-pointed towards either end, that is lance-shaped, and on very short petioles; whereas the stalks of the second are upright, and will climb a little, and the leaves are hollow at the base and ovate, sharper pointed at the end, and on longer petioles.

There is a third sort, called *Upright Periwinkle*, for which we are obliged to the Island of Madagascar, and of course it requires the protection of a stove, in our colder climates. It has a stiff, upright, branching stalk, woody at bottom; the leaves are of an oblong ovate shape, smooth and succulent, and sitting pretty close to the branches; from the *axæ* of these come out the flowers, on very short peduncles, generally single, but sometimes two together: the tube of

^t *Vinca minor* Lin. Curtis, Lond. III. 16.

^u *Vinca major* Lin. Curtis, Lond. IV. 19.

^v *Vinca rosea* Lin. Mill. fig. 186.

the corol is long and slender, the brim very flat, the upper surface of a bright crimson or peach colour ; the under of a pale flesh colour : and there is a constant succession of these beautiful flowers from February to October : the corol is sometimes white.

The *Oleander* ^w is one of the most beautiful plants of this tribe. The genus has two erect follicles, like the last ; but the seeds inclosed in them are downy ; there is a short crown also terminating the tube of the corol, cut into narrow segments, and the divisions of the corol are oblique to the tube. This shrub grows to the height of eight or ten feet ; the branches come out by threes from the main stem ; and the leaves also come out by threes from the branches, on very short petioles, point upwards, are very stiff, and end in sharp points. The flowers come out in bunches at the ends of the branches ; the corol is of a bright purple, varying to crimson or white. It grows wild in several countries about the Mediterranean Sea, but with us is generally kept in tubs, not being hardy enough to sustain the severity of all our winters.

But the most admired of this tribe is the *Cape Jasmine* ^x, which was first discovered near the Cape of Good Hope by the superior

^w *Nerium Oleander* *Lin.* Figured in Miller's illustr.

^x *Gardenia florida* *Lin.* Mill. fig. 180.

fragrancy of its flowers. The divisions of the calyx are uniform and vertical, and the seed-vessel is a two or four-celled berry, below the flower. The branches come out by pairs; and the leaves are opposite, close to the branches, of a shining green, and thick consistence: the flowers are produced at the ends of the branches; the corol is of one petal only, but cut into many segments, of which it has sometimes three or four rows, and then it is as large and as double as a rose: the anthers are inserted on the tube without filaments. The colour of the corol is white, changing as it decays to a buff-colour; and the odour is that of Orange flowers or Narcissus.

There is another plant of this order of twisted corols, called also a *Jasmine*, with the addition of *Red*, but of a very different genus from the *Jasmines*, properly so called. *Plumeria* or *Red Jasmine* has two reflexed follicles, with the seeds flat, winged and imbricate. There are four or five known species, all natives of the Spanish West Indies, except one, which comes from Senegal. The sort most known^v has oblong ovate leaves, with two glands upon the petioles: it grows to the height of eighteen or twenty feet; the stalks abound with a milky juice, and towards the top put out a few thick succulent

^v *Plumeria rubra* Lin. Catesb. car. 2. 92, Ehret. t. 10.
branches;

branches; at the ends of which come out the flowers in clusters, shaped like those of the Oleander; of a pale red colour, and having an agreeable odour. These being never succeeded by the fruit in our northern climes, you will not be able to discern the generic character.

The famous *Jesuits' Bark* is from a tree of this class and order^z, approaching in its characters to the natural tribe of *Contortæ*: to which also belong some plants of the second order of this fifth class, because they have two pistils: such are the *Periplocas*, the *Cynanchums*, and the numerous genus of *Asclepias*, containing twenty-seven species. Of this last, you have the common *Swallow-wort*, or *Tame-poison*^a, whose root is supposed to be a powerful antidote to poisons: it has a short upright stalk, ovate leaves bearded at the base, white flowers growing in proliferous umbels^b, and each of them succeeded by two long, jointed follicles, inclosing several compressed seeds, crowned with a soft white down. This is a native of the southern countries of Europe, and is very hardy. Other species are much larger, growing to the height of six or seven feet. Some creep very much at the root, and become trouble-

^z *Cinchona officinalis* Lin.

^a *Asclepias Vincetoxicum* Lin. Fl. dan. 849.

^b That is, the large umbels have smaller ones issuing from them.

some

some in a garden. Others coming from the Cape, or the warm parts of America, require care and heat to preserve them. Some have white, others purple, orange or red corols. Some have the leaves opposite, others have them alternate; in some again they are flat, whilst others have their edges rolled back. Many of the sorts are very handsome. They all agree in the following circumstances, which therefore form the generic character—that the segments of the corol are bent back; that five ovate, hollow nectaries, ending at bottom in a sharp spur, involve the stamens and pistils; and that each flower is succeeded by two follicles, inclosing many downy seeds.

Stapelia is so remarkable a plant of this tribe, that I must not omit mentioning it. This has a very large wheel-shaped corol, divided beyond the middle into five segments, which are broad, flat, and sharp-pointed. The nectary is a double star, one of them surrounding, the other covering the stamens and pistils. Two follicles, inclosing many flat, downy seeds, follow each flower.

There are three known species, all growing naturally at the Cape of Good Hope, and all having succulent branches, as thick at least as a man's finger. The three sorts are distinguished by the indentures on the sides of these leafless branches; which in
the

the first ^c spread open horizontally, ending in acute points; in the second ^d have their points erect; and in the third ^e obtuse.

In the first species the flowers come out singly on a short peduncle from the side of the branches towards the bottom: the corol is greenish on the outside, but yellow within, having a purple circle round the nectaries, and the whole is finely spotted with purple, like a frog's belly. The branches of the second sort are much larger, and stand more erect; they have four longitudinal furrows, and the indentures are on the ridges between them. The flowers are much bigger than those of the last, of a thicker substance, and covered with fine purplish hairs: the ground of it is a greenish yellow, streaked and chequered with purplish lines.

But the great singularity of these plants is, that the flower when fully open has a fetid smell so perfectly resembling that of carrion, that the common flesh fly deposits her eggs in it, which frequently are hatched into little worms, but never proceed any farther, or become flies. A rare instance this, of an animal mistaking its instinct.

^c *Stapelia variegata* *Lin.* Bradl. succ. 3. t. 22.

^d *Stapelia hirsuta* *Lin.* Mill. fig. 258.

^e *Stapelia mammillaris* *Lin.* Burm. afr. t. 11.

Having

Having by this time sufficiently fatigued you, I leave you, dear cousin, to meditate on this irregularity in the operations of nature, and once more heartily bid you adieu.

LETTER XVII.

May the 1st, 1775.

I AM not surpris'd, dear cousin, at your being solicitous to know what the nectary is, which I mentioned several times in my last. But I am not dispos'd at present to satisfy your curiosity any farther, than to inform you, that it is an appendage to the corol, and that there is a juice in it, probably of use to the plant, certainly serving for the food of bees, and numberless other insects. It is a perfect Proteus, and puts on a far greater variety of forms than the son of Neptune. Another time I may perhaps enter more deeply into this matter; but at present we will go straight on our way.

You will have great pleasure when I inform you, that the second order of the fifth class^f is almost wholly made up of the *Umbellate* tribe of plants^g, which you are already so well acquainted with: there are however some, which the circumstances of having five stamens and two pistils, bring into the same division of the arbitrary system, though they are not naturally related to them. A few of these we will examine,

^f Pentandria Digynia *Lin.*

^g See letter V.

before

before we enter into a detail of the *Umbellate* tribe.

Many of them have incomplete flowers, or are deficient in the corol; and may be found among the *Oleraceous* plants in the natural orders of Linnæus, by other authors called *Apetalous*.

Such are all the *Goosefoots*, of which there are no less than twenty species, most of them growing common on dunghills, and in waste places, and having no beauty to attract your notice. They are known by their five-leaved, five-cornered calyx, inclosing one round, flattish seed, shaped like a lens. One of the most respectable species is the *English Mercury* or *Allgood*^b, growing frequently in waste places, and by walls and way-sides; and cultivated in some places as a substitute to Spinach. The leaves of this are triangular, quite entire, waving, and having the under surface covered with a kind of meal; the flowers grow in compound spikes, which are destitute of leaves, and spring from the *axe*.

Beet is very nearly allied to these in its characters; but it is distinguished by having a kidney-shaped seed, wrapped up in the substance of the calyx. In its wild state, on

^b *Chenopodium Bonus Henricus* Lin. Curtis, Lond. III. 17. Ger. 32.

the sea-coast, and in salt marshesⁱ, it has two flowers coming out together, the stalks are weak, and lie mostly on the ground, the leaves are triangular and oblique or vertical; the divisions of the calyx are equal and not toothed at bottom, and it flowers the first year of its rising from seed. The garden fort^k has many flowers coming out together, the stalks erect, the leaves oblong lance-shaped, thick and succulent; the divisions of the calyx are toothed at the base, and it does not flower till the second year.

It sometimes has pale green leaves, and small roots; sometimes dark red or purple leaves with large, purple roots shaped like a carrot; but these are not generally supposed to be distinct species.

The *Gl. ssworts* are also of this *Oleraceous* tribe. They are distinguished by having a large seed, spiral like a screw, covered with a kind of capsule which is wrapped up in the calyx. There is one sort that grows wild in the salt marshes^l, which has a herbaceous stalk that lies on the ground; awl-shaped, rough-leaves terminating in spines; the calyxes edged, and sitting close in the *alæ*; and a trifid style.

Another sort which grows wild in warmer

ⁱ *Beta maritima* Lin.

^k *Beta vulgaris* Lin.

^l *Salsola Kali* Lin. Ger. 1117.

countries^m, has also herbaceous spreading stems; but it is a much larger plant than the other, and the leaves have no spines. These or any of the sorts yield the caustic alkaline salt, which is so necessary in that most elegant and useful manufacture of glass; but this is the sort generally used.

The *Globe Amaranth*ⁿ is of this class and order. Its fine round head is composed of many flowers, which have a large, boat-shaped, flat, coloured calyx, of two leaves; a corol divided into five rude, villous segments; a cylindric nectary, divided into five parts at top; a style cut half way into two; and a capsule opening horizontally, and containing one seed. India is its native country: the stalk is erect and annual; the leaves are lance-shaped, as are the branches, and peduncles, which are long, and naked, except that a pair of short leaves grows close under each head of flowers, which always comes out single. The calyx and corol being dry and chaffy, will retain their colour several years, and hence their name of *Amaranth* or *incorruptible*. Bright purple is the usual colour, but sometimes the heads are brilliant white, or silver-coloured. The name must not lead you to suppose this, any more than the *crested Amaranth*, to be of the

^m Salsola Soda Lin.

ⁿ Gomphrena globosa Lin. Mill. fig. pl. 21.

same

same kind with the true *Amaranth*°. When you are told that the *Elm* is of the same class and order, and also one of the incomplete tribe, as having no corol, you will probably reflect that an artificial system is very different from a natural arrangement: and in this you are not mistaken; but then you must consider, that an artificial system is the only one that can enable you to find out the genera and species of plants, which is the art I propose to instruct you in. Few persons know that the Elm has any flower, because it is inconsiderable in size and appearance, and comes out in an early inclement season: however this tree in reality abounds in flowers, before the leaves make their appearance. They have no corol, but a quinquefid calyx: the flower quickly passes, and is succeeded by one seed covered and surrounded by a flat membrane. The different sorts, known by the names of *Rough Witch Elm*, *Smooth-leaved Witch Elm*, *Witch Hazel*, *English Elm*, *Dutch Elm*, *Upright Elm*, &c. are supposed to be varieties of one species^p; and all have doubly-ferrated leaves, unequal at the base.

The *Gentians* are also of this class and order, and of that sub-division which has monopetalous inferior corols. They are dis-

° See Letter XXVIII.

^p *Ulmus campestris* Lin. Duham. t. 108.

Q

tinguished

tinguished from the other genera of this subdivision, by the capsule, which is oblong, round, and sharp-pointed; has one cell, and opens by two valves; having within two receptacles, each adhering lengthwise to one of the valves. The form of the fruit is constant; whereas the figure and number of parts in the flower vary in the different species, which are numerous^q. Great part of the skill and sagacity of the botanist consists in seizing those parts which are constant in all the species, for the generic characters, and in this consists the great merit of Linnæus; writers before him having either taken all parts indiscriminately, or else the same part invariably for this purpose.

The species have either four or five petals, and the latter have either funnel-shaped corols, or else approaching to bell-shaped; hence a threefold division of the genus.

The principal of the genus is the *Great Yellow Gentian*^r, which has a single stalk, three feet high, covered with leaves that are large, ovate, marked underneath with nerves meeting at the tip; the lower ones petiolate, the upper sessile. There is but one flower to a peduncle, but they grow round the stalk in whorls: the calyx resembles a double spathe: the corol is rotate, cut into five seg-

^q Thirty-nine.

^r *Gentiana lutea* *Lin.* Mill. fig. 139. 2.

ments^s; the colour yellow irregularly dotted. The root is very large, and remarkably bitter; it communicates the bitterness so much to the whole plant, that it remains always untouched by the cattle in the mountainous pastures of Germany and Swisserland, where it grows naturally.

The *Lesser Centaury*^t is of this genus, and is distinguished by its dicotomous stalk, and its funnel-shaped corols divided into five segments; they are of a bright purple colour, but often fade to white. This plant is annual, and varies much in height according to the soil, from three or four inches to a foot. This is extremely bitter as well as the other.

There are several beautiful little Gentians, with flowers of the finest blue that can be imagined, growing wild in the Alps. One of them is frequently cultivated in gardens, under the name of *Gentianella*^u, and is singular for having its fine bell-shaped azure flowers larger than the whole plant besides.

Yellow Centaury^v is also naturally of this genus; but has been removed to the eighth

^s Varying sometimes as far as eight.

^t *Gentiana Centaurium* Lin. *Chironia Centaurium* Curtis, Lond. IV. 22.

^u *Gentiana Acaulis* Lin. Jacquin austr. 2. t. 135.

^v *Chlora perfoliata* Lin. See letter XIX.

class; first with the title of *Blackstonia*, and now under that of *Chlora*.

But methinks you are languishing to be on ground you are better acquainted with. And indeed you are already so well versed in the nature of the umbellate tribe, that I am persuaded you will find little difficulty in determining the genera and species. Many of them are very generally known, either for their use in medicine or the kitchen, or else for their poisonous qualities. Most of those which grow on dry soils have roots that have an aromatic pungent smell and taste; whilst those which grow in moist places or in the water, as many of them do, are in a greater or less degree poisonous.

You have long since been able to distinguish true Parsley and Chervil from Fool's-Parsley^w. There is another wild plant that grows upon banks and by way-sides, called *Hemlock-Chervil*^x, which has been mistaken for *Garden-Chervil*^y, and has produced bad effects, when put into soups: it is not however so dangerous, because it does not grow wild in gardens, and we must go out of our way to poison ourselves: on another account however it is more dangerous, because it is not only of the same division, as having

^w See letter V.

^x *Scandix Anthriscus* *Lin.* Curtis, Lond. I. 19.

^y *Scandix Cerefolium* *Lin.* Jacquin austr. 4. t. 390.

partial involucre only, but also of the same genus; and therefore liable to be mistaken for the true Chervil, even when in flower, which Fool's-Parsley cannot be. They have both a radiate corol, petals notched at the end, the flowers in the middle often incomplete and producing no seed, and the fruits of an oblong shape. However, notwithstanding all this similitude of character, they are easily to be distinguished both in and out of flower. *Hemlock-Chervil* is a much lower plant; the stalks are smooth indeed, and the leaves finely cut, but they are hairy, the divisions much smaller and closely placed, and the green much deeper than in *Garden-Chervil*; the corols also are uniform, the seeds ovate, and very rough. *Garden-Chervil* is a tall, genteel, smooth plant; the umbels come out on the sides of the branches, and sit close to them; and the seeds are long, narrow and shining. After all, I am persuaded that when you have an opportunity of comparing these two plants together, as you easily may, the gardener furnishing you with one, and the other being so common in a wild state, you will wonder that any person should ever have confounded them. Here you see we have an instance of an umbellate plant, growing on dry land, that is poisonous; you are not therefore to conclude that all these are

Q₃ wholesome,

wholesome, any more than that every water species is poisonous.

We have another instance of fatal confusion, not in two plants of this tribe, but in one of this, with another of a different class; namely of the *Creeping Water Parsnep*^z, with *Water Cress*^a, which belongs to the cruciform flowers. You are so well mistress of both tribes, that it is impossible you should mistake them when in flower; but this is not the time when Water-Cresses are eaten, and this plant is so different in its flowering state, that I am persuaded an eater of it would think himself imposed upon, if he were then shown it for Water-Cresses. When they are both young they are really not unlike; and since they frequently grow together, the one may sometimes be gathered for the other; though I must confess that I have not met with the mistake more than twice, and that only in a single piece among a considerable quantity: however, the leaves of Water Parsnep are of a light green; the lobes or small leaves composing the whole winged or pinnate leaf are longer and narrower, serrated on the edges, and pointed at the end: whereas those of Water-Cresses

^z *Sium nodiflorum* Lin. Fl. dan. t. 247. Mor. hist. f. 9. t. 5. f. 3. Ger. 256.

^a *Silybrium Nasturtium* Lin. Fl. dan. t. 690. Mor. hist. f. 3. t. 4. f. 8. Ger. 257.

have a tincture of brown upon them, the lobes are roundish, and particularly the odd lobe at the end is very large and blunt, and they are none of them regularly serrated, but have only a few indentures on their edges.

The characters by which you will know the Water Parsnep when in flower are these—it has both an universal and partial involucre, the flowers are all fertile, the petals are heart-shaped, and the seeds are ovate and streaked. This species is distinguished from the others by its pinnate leaves, and the umbels of flowers sitting close to the stem, in the *alæ*.

Another poisonous herb of great fame is the *Hemlock*^b. A tall plant, three feet high and more, easily known by its purple-spotted stalk. It has both involucre, the universal of three, four, five, or seven broadish reflexed leaves; the partial of three or four broad leaves only, on one side of the umbel; both very short. The flowers are all fertile; irregular without, regular within: the petals heart-shaped. The fruit is almost spherical, marked with five notched ridges. The common species is distinguished by its smooth streaked seeds. The leaves are large, abundant, of a dark green but

^b *Conium maculatum* Lin. Curtis, Lond. J. 17. Ger 1061.

shining, triply pinnate, with the last divisions obtusely indented; it has many umbels of white flowers, with numerous spreading rays. It grows wild on ditch banks, in shady lanes, about dunghills and church-yards: and is a biennial plant.

The waters afford other poisonous herbs, as *Water-Hemlock*^c, *Long-leaved Water-Hemlock*^d, *Hemlock Water Dropwort*^e, and *Common Water Dropwort*^f: but let us quit these ill-omened plants, and proceed to others more innocent, and more within your reach.

Two umbellate plants you will be sure to find under every hedge, called *Wild Chervil*^g and *Rough Chervil*^h; they are both of the same genus, but of a different genus from Garden Chervil. They have partial, but no universal involucre; these are of five leaves, concave and bent back; some flowers in the middle drop without leaving seeds; the petals are bent in and heart-shaped; and the fruit is oblong and smooth. The first, vul-

^c *Phellandrium aquaticum* *Lin.* Mor. hist. f. 9. t. 7. f. 7. Ger. 1063.

^d *Cicuta virosa* *Lin.* Fl. dan. 208. Mor. hist. f. 9. t. 5. f. 4. Ger. 256.

^e *Oenanthe crocata* *Lin.* Philos. Transact. for 1747.

^f *Oenanthe fistulosa* *Lin.* Fl. dan. 846. Mor. hist. f. 9. t. 7. f. 8. Ger. 1060.

^g *Chærophyllum sylvestre* *Lin.* Curtis, Lond. IV. 25. Ger. 1038.

^h *Chærophyllum temulum* *Lin.* Mor. hist. t. 10. f. 7. Ger. 1038.

garly called *Cow-weed* or *Cow-parsley*, has a smooth streaked stalk, and the joints swelling but a little. The second has a rough stalk, and the joints more tumid. The first is remarkably leafy, and the leaves very large, and generally smooth, except the nerves. The second has hairy leaves, not so large, nor so much divided; the umbels usually nod, and the seeds are deeply streaked. Both sometimes have a leaf at the origin of the universal umbel: both have a strong smell, and approach in their qualities to the forementioned plants, but not enough to denominate them poisonous.

Some of this tribe are so generally used in food, that they are universally known, and therefore it seems impertinent to say any thing to you about them; and yet you may have eaten the roots of Carrots and Parsneps, the stalks of Angelica, Celeri and Fenchia, the leaves of Parsley, Fennel, and Sampire, the seeds of Coriander and Carraways, without knowing one of the plants when they are presented to you. However, when you meet with any of these in flower, you ascribe them immediately to the umbellate tribe. Carrot, Sampire, and Angelica range among those which have both involucre; Coriander has a partial involucre only; and the rest have neither one nor the other. *Carrot*ⁱ

ⁱ *Daucus Carota* Lin. In the cultivated sort all the flowers are fertile, Fl. dan. 723. Mor. umb. t. 2. Ger. 1028.

has

has a large winged involucre: some flowers in the middle drop without seed, and the fruit is stiff with bristles. The outer flowers are very irregular: and the whole umbel, as it approaches a state of maturity, takes a hollow form, very like a bird's nest. The leaves are rough and hairy. The garden Carrot differs little from the wild one, but in the size and tenderness of the root.

Sampire^{*} has the umbel not flat, or hollow like the last, but hemispherical, the flowers all alike and fertile, the petals flat, the fruit ovate, flattened. The stalks are succulent, the leaves pinnate, composed of three or five divisions, each of which has three or five small, thick, lance-shaped leaves; the corols are yellow. This herb strikes its roots deep into the crevices of the rocks, and hangs down; growing chiefly in places difficult of access, the herb gatherers are tempted to substitute another plant¹, which they obtain without trouble on the beach, but which has none of the warm, aromatic quality of the Sampire. Those who live on the East coast must wonder what is meant by calling the occupation of a Sampire-gatherer, *dangerous trade*, when they obtain it walking at their ease on the flat sandy shore. But theirs is a roundish, jointed, tasteless stalk, with a tough string

^{*} *Crithmum maritimum* Lin.

¹ *Inula crithmoides* Lin. Golden Sampire.

running through the middle of it^m, instead of a flat leaf, with a pungent taste. This Marsh Sampire ranges in the first order of the first class, and is burnt to make kelp for the glass-works. Here you see what confusion of names we have again, and how difficult it must be to obtain the plant you want, without knowing something more of it than the name. It is generally true of objects much in request, that where people have them not, they substitute others, to which they give the same title, whether they have the same qualities or no; by which if they do not injure themselves or their neighbours, they at least mislead the incautious and unexperienced naturalist.

Angelica has large globose umbels, all the flowers in them are regular and fertile, the petals are inflexed, or bent upwards at the end; the fruit is roundish, cornered, or furrowed, and terminated with two reflexed styles.

The cultivatedⁿ and wild^o *Angelica* are allowed on all hands to be distinct species. They have both pinnate leaves; but the first has the odd lobe at the end divided generally into three parts: the second has

^m *Salicornia europæa* *Lin.* Marsh Sampire, called also jointed Glasswort or Saltwort.

ⁿ *Angelica Archangelica* *Lin.* Fl. dan. t. 206.

^o *Angelica sylvestris* *Linnaei.* Mor. hist. f. 9. t. 3. f. 2. Ger. 999.

all the lobes equal, lance-shaped, and serrated about the edges. The first is a much larger plant in all respects, the lobes of the leaves broader, rather ovate than lance-shaped, and the corols greenish: the second, has a thinner and less succulent stem, scarcely any universal involucre, and the corols tinged with red.

Coriander has no proper universal involucre, though there is sometimes one leaf, as in the Wild Angelica; the partial one consists of three leaves, and is short. The flowers in the middle produce no seed; the petals are bent inwards, and heart-shaped; the outer ones large. The fruit is spherical, as you know. The calyx of each little flower is more evident in this than in the other umbellate plants. The divisions of the leaves next the ground are broad; those of the upper ones narrow: they and the whole plant are smooth, and have a strong rank smell, like bugs^p.

Parsnep^q has all the flowers fertile and regular, the petals entire, and bent inwards; the fruit oblong, flattened, and surrounded with a membrane. The leaves are simply pinnate. The garden Parsnep differs not specifically from the wild, which has hairy leaves, whereas those of the first are smooth;

^p *Coriandrum sativum* Lin. Ger. 1012.

^q *Pastinaca sativa* Lin. Ger. 1025.

but smoothness is a common effect of culture. The cultivated plant is also of course much larger, and the roots succulent and esculent: both have yellow corols.

Fennel^r has likewise all the flowers fertile and regular; and the petals entire and bent inwards, as in the last: the fruit is nearly ovate, flattened, and streaked. *Dill*^s, which is also of this genus, has the fruit surrounded with a membrane, and more flattened than that of Fennel. *Sweet Fennel* is but a variety of the common sort, though the lobes of the leaves are longer, more slender, and not so dense as in that: the seeds are longer and much sweeter. *Finochia* is probably another variety, though a much humbler plant, swelling much in breadth and thickness just above the ground. The leaves of all these are very finely cut.

Carraway^t has no proper involucre, but a single leaf at the origin of the universal umbel; the middle flowers fall without seed; the petals are keeled, bent inwards, and notched at the end; the seeds are of an oblong ovate form, and streaked.

Parsley^u and *Smallage*, or *Celeri*^v, are of

^r *Anethum Foeniculum* *Lin.* Mill. illustr. Moris, f. 9. t. 2. f. 1. Ger. 1032.

^s *Anethum graveolens* *Lin.*

^t *Carum Carui* *Lin.* Mor. umb. t. 8. Ger. 1934.

^u *Apium Petroselinum* *Lin.*

^v *Apium graveolens* *Linnaei*. Fl. dan. 790. Moris, t. 9. f. 8. Ger. 1014.

the same genus. They have a sort of involucre, generally of one leaf; all the flowers fertile; the petals equal, and bent inwards; the fruit small, ovate, and streaked. They have both winged leaves, with the lobes linear on the stalk in Parsley, wedge-shaped in Smallage, of which Celeri is only an improvement from warmer countries. Our wild Smallage however, which is common by ditches and brooks, cannot be rendered esculent by culture.

Earth-nut or *Pig-nut*, ^w whose roots are like a small potatoe and eatable, has both involucre, the lesser ones narrow as a hair; the flowers in a close umbel, all fertile; the corols regular, with heart-shaped petals; and the fruit ovate. It grows, not uncommonly, wild on dry pastures.

Ferula ^x, in the dry stalk of which Prometheus brought fire from heaven, has both involucre; all the flowers fertile, the petals heart-shaped; the fruit oval, flat, and marked with three streaks on each side. It is so lofty and large a plant as to have acquired the name of *Fennel-giant*; the lower leaves spread two feet, and are subdivided into very long, narrow, simple lobes; the stalk is hollow, jointed, and will grow ten or twelve feet high: when these are dry they have a

^w Bunium Bulbocastanum *Lin.* Curtis, Lond. IV. 24. Ger. 1064.

^x *Ferula communis Lin.*

light dry pith, which readily takes fire; and the people of Sicily use it as tinder. It is a species of *Ferula* that produces the *Affa foetida*¹.

*Cow-Parsnep*² is a very large plant, though not so gigantic as the last. It has two involucre, but as they are very apt to drop off, you may easily be deceived in that respect. The corol is very irregular, bent in and notched. The fruit is ovate, notched, flattened, streaked, and with a membrane round the edge. In most of the species, the middle flowers fall seedless; but in our common one all the flowers are fertile: the leaves are winged, and the lobes pinnatifid. This plant grows common in meadows and pastures.

Shepherd's-needle or *Venus's-comb*^{*} is remarkable for long processes or beaks terminating the seeds, and giving it the appearance of *Geranium*, when in fruit. It is of the same genus with *Chervil*, and is a common weed among corn. But of these umbellate plants enough.

Of the third order of this fifth class we have several trees and shrubs; as the *Varnish-trees* and *Sumach*, *Wayfaring trees* and *Laurustinus*, *Cassines*, *Elder*, *Bladder-nut*, &c.

¹ *Ferula Affa foetida* *Lin.* *Kœmpf. amœn.* t. 536.

² *Heracleum Sphondylium* *Lin.* *Mor. hist.* f. 9. t. 16. f. 1. *Ger.* 1009.

^{*} *Scandix Pecten* *Lin.* *Mor. hist.* f. 9. t. 11. f. 1. *Ger.* 1040.

The first are known by their inferior flowers, their five-leaved calyx, their corol of five petals, and their berry with one seed in it.

Virginian Sumach^a is common among your shrubs, and known to you by the young branches being covered with a velvet-like down, resembling both in colour and texture a stag's horn when first budding; the branches are crooked and deformed; the leaves are winged, with six or seven pair of lance-shaped lobes, sharply serrated, and nappy beneath. The flowers are produced in close tufts at the ends of the branches, and are followed by seeds inclosed in purple, woolly, succulent covers, which give them their autumnal hue, when the leaves fade first to purple and then to feuillemort colour.

Wayfaring-tree^b, *Marsh-elder*^c, and *Laurustinus*^d, are all of one genus; having superior flowers, a five-leaved calyx, a corol divided into five segments, and a berry inclosing one seed.

The first has heart-shaped leaves very much veined, serrated about the edges, and white underneath. The second has lobate leaves, with glands upon the petioles; the

^a *Rhus typhinum* *Lin.* .

^b *Viburnum Lantana* *Lin.* Duhamel, t. 103. Ger. 1490.

^c *Viburnum Opulus* *Lin.* Fl. dan. 661. Duham. t. 16. Ger. 1424.

^d *Viburnum Tinus* *Lin.*

flowers round the outside of the *cyme* are barren, with the corols much larger than the others. The *Gelder Rose* is a remarkable variety of this, with the flowers growing in a ball, and every one of them barren. The third has the leaves ovate, and entire, with the veins underneath villous: this is an ever-green.

The fourth order is a very small one, comprising only two genera; of which *Parnassia*^e is one. This grows wild in wet meadows, and on the borders of marshes, but not very common. It is easily known by its calyx divided into five parts; its corol of five petals; five heart-shaped nectaries, furnished with hairs, upon the top of which are little balls; a large ovate germ, without any style; but four stigmas; and a capsule of one cell and four valves. It has a single stalk, with one heart-shaped leaf on it, embracing the stalk, and one flower only; the corol is white.

Of the fifth order, *Pentagynia*, is *Thrift*, *Flax*, &c. *Thrift*^f has the calyx of one leaf, entire, plaited and dry, like chaff^g; a corol of five petals; and one seed crowned with the calyx. These are the characters of the genus, which has twenty-two species. Common Thrift has a threefold involucre or

^e Mill. illustr. Fl. dan. 584. Ger. 840.

^f Statice Armeria Lin. Mier. hist. f. 15. t. 1. f. 29. Ger. 602.

^g Scariose.

R

common

common calyx, and the flowers growing in a round head, upon the top of a naked stalk; the leaves, which form a close tuft near the ground, are linear. The corols are red, of different shades, from pale flesh colour to a bright scarlet; varieties occasioned by soil and situation; for this plant is found both on salt marshes and mountains. Thrift was much used formerly for edging the borders in flower gardens, but it is now almost entirely out of date.

Flax has also a corol of five petals; but the calyx is five-leaved, and the capsule opens by five valves, having ten cells within, in each of which is one seed. There are no less than twenty-two species of Flax: that whose use is so extensive^b is distinguished from the rest by the calyx and capsule being pointed, the petals being notched, the leaves lance-shaped, and alternate upon the stem, and the stalk unbranched. On the top of this are four or five flowers, with beautiful blue corols, very apt to fall off. It is an annual plant, about a foot and half high, in the fields. In the garden it will grow six inches higher, and branch a little where it stands detached.

Both the use and beauty of Flax will interest you; so I leave you with this impression, and bid you once more adieu.

^b *Linum usitatissimum* *Lin. Mor. hist. f. 5. t. 26. f. 1. Ger. 566.*

L E T T E R XVIII.

May the 15th, 1775.

WE are returned, dear cousin, to the point from which we first set out*; the liliaceous tribe of plants being included in the first order of the sixth class, in the System of Linnæus. These superb and beautiful flowers have gained so much on the esteem of the curious in Europe, that they have spared neither trouble in fetching them from the farthest parts of the East, nor expense in cultivating them at home. Hence they are so generally known, that persons not at all versed in Botany readily find them to be of the same family. You certainly are at no loss to determine their general relation and analogy, from the hints which were thrown out in the first letter, and the experience you have since acquired. It remains therefore only to be acquainted with their generic and specific characters; to which end I shall present you with some that may be most within your reach: were I to set every liliaceous plant before you whose beauty merits your attention, I should almost exhaust the tribe. Two cautions you are to observe: first, that

* See letter I.

the whole liliaceous tribe is not confined to the class *Hexandria**, though the far greater part of it is; secondly, that other plants, few indeed in numberⁱ, are to be found in the same order.

You remember that the Lily had no calyx; you are not however to suppose that the whole tribe is destitute of this important part of the flower. It is a circumstance that occasions a threefold subdivision of the order, into such as have a calyx; such as have a spathe or sheath, covering the corol whilst a bud, but torn and forsaken by the corol when it is expanded; and lastly, such as have the corol quite naked.

You would not perhaps have suspected at first sight that the *Ananas* or *Pine-Apple* is of this tribe. It is almost the only genus capable of misleading you. The flower has a trifid, superior calyx, a corol of three petals, a scale fastened to the base of each petal; the fruit is a sort of berry. The species^k is distinguished by its long, narrow, pointed leaves, like those of Aloes, serrated on the edges, and set with tender spines; and by the fruit being terminated with a bush of leaves, commonly called the crown, which being planted takes

* See Letter XIV.

ⁱ Eighteen genera out of 65. The whole class has eighty-one genera and four hundred and seventy-three species.

^k *Bromelia Ananas Linnæi*. Comm. hort. 1. t. 57. Trew Ehret. t. 2.

root, and produces another fruit. There are differences in the fruit, proper to be remarked by those who cultivate this luxury; but they are no more than varieties of the same species, and therefore do not concern us as botanists.

Tradescantia or *Virginian Spiderwort*¹ is another of the liliaceous tribe furnished with a calyx, which in this is three-leaved; the corol also has three petals, and the capsule has three cells. It is remarkable for having the filaments fringed with purple jointed hairs. The species common in gardens is distinguished from seven others, by its smooth, erect stalk, and by the flowers growing in clusters at the top of it. These are of a fine purple, and blow in succession most part of the summer, though each flower continues open but a day. From the number of parts in the fructification, and its ensiform leaves, this plant will range in the same natural order with *Iris* and its congeners^m.

Of those which have a *spathe* or *sheath* instead of a calyx, there is the modest, the humble, the early *Snow-drop*ⁿ; that comes one of the first of the year to salute us, and, no less white than the snow itself, is frequently covered by it. This is distinguished by its

¹ *Tradescantia Virginica* Lin. Mor. hist. f. 15. t. 2. f. 4.

^m Called *Ensatæ* by Linnæus. See letter XIV.

ⁿ *Galanthus nivalis* Lin.

superior corol of six petals, of which the inner ones are shorter by half than the others, and notched at the end. More needs not to be said of a flower so universally known.

Narcissus is another of this division. There are many species, all united by these characters: a superior corol of six equal petals, and a funnel-shaped nectary, of one piece, within which are the stamens. The most known species, are the *common white Narcissus*^o, the *Daffodil*^p, the *Polyanthus Narcissus*^q, and the *Jonquil*^r. The first and second, in a natural state, have only one flower bursting from the same sheath; the third and fourth have several; the first has the nectary or cup in the middle of the flower, wheel-shaped, very short, chaffy, and a little notched at the edge: the second has a large, erect, curled, bell-shaped cup^s, sometimes as long as the ovate petals of the corol: the third has a bell-shaped, plaited cup, truncate at the end; and one third of the length of the petals; this has flat leaves, whereas the fourth has them subulate, long, and narrow like a rush; this also has a short bell-shaped cup. The esteem

^o *Narcissus poeticus* *Lin.* Ger. 124.

^p *Narcissus Pseudonarcissus* *Lin.* Ger. 138.

^q *Narcissus Tazetta* *Lin.*

^r *Narcissus Jonquilla* *Lin.* Curtis, bot. mag. 15.

^s Daffodillies fill their cups with tears—Daffodils that come before the swallow dares, and take the winds of March,

in which these flowers have been always held, is the occasion that a great number of beautiful varieties have been produced from the plain simple parents. The Dutch catalogues have no less than thirty varieties of *Polyanthus Narcissus*: and in the other three the cup is entirely changed into petals by culture. The petals of the first are white, and the cup yellow: the petals of the second are naturally pale brimstone, and the cup yellow: the petals of the third are either white or yellow, with orange-coloured cups: and the fourth is all yellow.

There is no genus of plants in the whole round of vegetable nature more superb and beautiful in its flowers than the *Amaryllis*: known by its superior, bell-shaped corol of six petals; its stamens of unequal length; and its trifid stigma. Besides several other species, either less obvious, or less beautiful, you will find here the *Jacobeæ Lily*^c, which produces but one, or at most two of its large, deep-red flowers, from the same sheath; the three under petals are larger than the others, and with the stamens and pistil are bent downwards: the whole flower stands nodding on one side of the stalk, and makes a most beautiful appearance, especially in the sun, when it appears to be powdered with gold dust.

^c *Amaryllis formosissima* Lin. Mill. fig. pl. 23.

The *Mexican Lily*^u has several flowers, generally from two to four, bursting from the same spathe; the corol is bell-shaped and regular, the three outer petals are reversed or reflexed at the tip, the three inner ones are ciliate at the base; the stamens and pistil are bent downwards. The flowers are large, of a bright copper colour, inclining to red; and the style is red, which is unusual: the base of the corol is of a whitish green.

The *Guernsey Lily*^v has also many flowers in the same sheath, the corols revolute, or rolled back, and the stamen and pistil upright. The corols are of the richest red colour, powdered with gold. This fine flower is supposed to have come originally from Japan.

The Tulip and some others which I shall now present to you, agree with the Lily in having naked, unprotected corols^w. The *Tulip*^x, unbounded in the variety of colour, in the cultivated state of its gaudy flowers, has an inferior bell-shaped corol of six petals, and no style, but only a triangular stigma, sitting close to a long, prismatic germ. The species is distinguished by its short lance-

^u *Amaryllis Belladonna* Lin. Mill. pl. 24.

^v *Amaryllis farniensis* Lin. Douglas monogr. Ehret. t. 9. f. 3.

^w Linnæus has split the liliaceous tribe, in his natural orders, into the *Ensatæ* before-mentioned; the *Spathaceæ* just gone through; and the *Coronariæ* into which we now enter. Some also of his *Sarmentaceæ* belong to this tribe.

^x *Tulipa Gesneriana* Lin.

shaped

shaped leaves, and its upright flowers, from the *Italian Tulip*^y, whose flowers nod a little, have longer and narrower lance-shaped leaves, yellow corols never varying in colour, ending in acute points, and having a sweet scent. The common colour of the Eastern Tulip, in a state of nature, is red. This when broken into stripes by culture, has obtained the imaginary value of a hundred ducats for a single root, among the Dutch florists.

How different is the sweet, the elegantly-modest *Lily of the valley*^z, from the flaunting beauty of the Tulip! The pure, bell-shaped corol, is divided at top into six segments, which are bent back a little: and the seed-vessel is not a capsule, as in most of this class, but a berry, divided however into three cells, in each of which is lodged one seed: this berry, before it ripens, is spotted. I doubt not but that you have often searched for it in vain, because this plant seldom produces its fruit: the reason is, that it runs very much at the root, and increases so much that way, as almost entirely to forget the other. I have seen large tracts covered with it, in the remote recesses of woods, without a single berry; and the way to obtain them, is to imprison the plant within the narrow cir-

^y *Tulipa sylvestris* Lin. Fl. dan. 375.

^z *Convallaria majalis* Lin. Fl. dan. 854. Ger. 410.
This is one of the *Sarmentaceæ* in the natural orders.

cuit of a pot, when by preventing it from running at the root, it will take to increasing by the red berry. This species is distinguished from *Solomon's-seal*, and others of the genus, by the flowers growing on a *scape* or naked stalk; it has only two leaves, which take their rise immediately from the root.

The *Hyacinth* is one of the most favoured plants of the florists. In the natural state, wherein you seldom see it, the corol is single, and cut into six segments; and there are three pores or glands, at the top of the germ, exuding honey. The species from whence all the fine varieties take their rise^a, has the corols funnel-shaped, divided half way into six segments, and swelling out at bottom. This must not be confounded with the *Wild Hyacinth* or *Blue-bells* of the European woods^b, which has longer, narrower flowers, not swelling at bottom, but rolled back at their tips; the bunch of flowers is also longer, and the top of it bends downwards. This is frequently found with white corols.

Aloe is a remarkable, beautiful, and numerous genus, distinguished by its erect corols, with a spreading mouth, divided into six segments, and exuding a nectareous juice at bottom: the filaments are inserted into the receptacle. Linnæus reduces them to ten

^a *Hyacinthus orientalis* Lin. Mill. fig. pl. 148.

^b *Hyacinthus non scriptus* Lin. Curtis, Lond. II. 18. Ger. 111.

species,

species, but there are many very distinct varieties, if not species, under each. They have all thick succulent leaves, and the species may be separated either by the forms of these, or by the forms and manner of growth of the flowers.

If you should hear of the *Great American Aloe*^c flowering any where in your neighbourhood, you will find that it differs from the Aloes, properly so called, by the corol being superior, or sitting on the top of the germ, and the filaments being longer than the corol. In the first circumstance this differs from almost all the liliaceous tribe, which have the germ inclosed within the corol. I should advertise you, that you must mount a ladder or scaffold to examine the flowers, for they grow on a stem that is sometimes twenty feet in height. You know it is a vulgar error that this plant flowers once only in a hundred years; the truth is, that in its own country it flowers in a few years from its birth; but in our cold inhospitable climes, it takes many years to produce its vast stem and numerous flowers, but the term of its life with us is uncertain; after having flowered, it produces a number of off-sets, and dies. This is not the case in the Aloes properly so called, and in them the flowering stem is produced from the side of the heart or

^c *Agave Americana Lin.*

central leaves, whereas in this it issues from the very centre, where you observe that the leaves lie very close over each other before they expand.

Of plants not liliaceous belonging to this first order of the sixth class, there is one shrub, the *Barberry*^d and several plants, deficient in the corol, as the *Calamus Aromaticus* or *Sweet Rush*^e, the *Rattan*^f, and all the species of *Rush*^g.

The *Rice*^h is almost the only plant to be found in the second order of this class. It has the exact form and structure of the Grasses, differing from them only in the number of stamens.

In the third order is the *Dock*, a numerous and prolific genus, containing thirty-one species. It is known by the calyx of three leaves, the corol of three connivent petals, and one triangular seed. These plants will not attract you by their beauty. Their flowers are more numerous than considerable. *Bloody Dock*ⁱ has the valves of the flowers quite entire, one of them bearing a seed, and the leaves are lance-shaped and

^d *Berberis vulgaris*. Mill. fig. pl. 63. Ger. 1325.

^e *Acorus Calamus* Lin. Mor. hist. f. 8. t. 13. f. 4. Ger. 62.

^f *Calamus Rotang* Lin. Rheed. malab. 12. t. 64, 65.

^g *Juncus* Lin. See letter XIII. at the end.

^h *Oryza sativa* Lin. Catech. carol. 1. 14. Mill. illustr.

ⁱ *Rumex sanguineus* Lin.

hollowed

hollowed next the petiole. *Curled Dock*^k has the valves entire and graniferous; the leaves lance-shaped, waving about the edges, and sharp-pointed at the end. *Fiddle-dock*^l has the valves notched about the edges, one of them usually graniferous, and the leaves next the ground shaped like the body of a violin. The great *Water Dock*^m has the valves entire and graniferous; the leaves lance-shaped and sharp-pointed. The common *Blunt Dock*ⁿ has the valves notched and graniferous; the leaves oblong, hollowed at the base, near which they are notched, and obtuse at the end. Common *Sharp Dock*^o has the valves oblong, entire, very small, the outer one graniferous; the leaves oblong and hollowed at the base, but drawn out into a long point. Two common species differ in one remarkable circumstance from all the rest; for they have the staminiferous and pistilliferous flowers on separate plants, and therefore strictly belong to the twenty-second class; but they are evidently, as you will confess upon examination, of the same natural genus with the Docks.

^k *Rumex crispus* Lin. Curtis, Lond. II. 20. Ger. 387.

^l *Rumex pulcher* Lin. Mor. hist. f. 5. t. 27. f. 13.

^m *Rumex Hydrolapathum* Hudf. Ger. 389.

ⁿ *Rumex obtusus* Lin. Curtis, Lond. III. 22. Ger. 388.

^o *Rumex acutus* Lin. Curtis, Lond. III. 21. according to him, *sanguineus* is only a variety of this.

These

These are the *Common*^p and *Sheep's Sorrel*^q, the first growing in meadows and pastures, the second on dry sandy grounds; the first with oblong, arrow-head leaves; the second with leaves shaped like the head of a halberd. Thus you have the means of distinguishing eight species of Dock.

Meadow-Saffron^r is also of this order, and clearly of the liliaceous tribe; its resemblance to Crocus or Saffron is obvious. Like that it has a *spathe* for a calyx; a corol divided into six parts, with the tube extending down to the bulb; and a trilobate capsule, of three valves and three cells. So that were it not that the one has three stamens with one style, and the other six stamens with three styles, they would be of the same genus. Meadow-Saffron has flat, lance-shaped, erect leaves, and flowers of a light purple; the first coming out in the spring, the latter in the autumn.

Of the last order of this sixth class are the *Water Plantains*, easily known by the calyx of three leaves, the corol of three petals, succeeded by several compressed capsules, each containing one seed. *Great Water Plantain*^s is common enough in wet places, and

^p Rumex Acetosa Lin. Mor. hist. f. 5. t. 28. f. 1. Ger. 396.

^q Rumex Acetofella Lin. Moris. t. 28. f. 11, 12. Ger. 397.

^r Colchicum autumnale Lin. Ger. 157.

^s Alisma Plantago Lin. Fl. dan. 561. Mill. illustr. Ger. 417.

on the banks of rivers and brooks: it is distinguished from its fellows by its ovate sharp-pointed leaves, and its obtusely triangular fruits. This is one of the plants in which you cannot err; if the differences of all were so strongly marked, your trouble would be diminished, but then your genius and sagacity, dear cousin, would not have so much room for exercise.

LETTER XIX.

June the 1st. 1775.

NATURE seems to have no delight in the number seven; the seventh being the smallest of all the classes: containing no more than seven genera, and ten species. Of these I shall select only one for your observation, which shall be the *Horse-Chestnut*^s. It is of the first order, and these are the principal characters of the genus—a small calyx, of one leaf, slightly divided at top into five segments, and swelling at the base; a corol of five petals, inserted into the calyx, and unequally coloured; a capsule of three cells, in one or two of which only is a seed. Linnæus says that though no more than one seed generally comes to perfection, yet there are two in the young capsule. But surely the third cell is not made for nothing; and therefore I should suspect that in Asia, the native clime of this fine tree, the capsule contains three nuts. The form of the *Horse-Chestnut* is grand, the pyramids of flowers beautiful, and making, with the large digitate leaves, a fine whole.

The eighth class has forty-four genera, and two hundred and seventy-three species.

^s *Æsculus Hippocastanum* Lin. Mill. illustr.

Indian

Indian Nasturtium or *Indian Cress*^u is one of these: the calyx is inferior, of one leaf cut into five segments, and terminated by a spur; the corol has five unequal petals, and is succeeded by three dry berries, in each of which is one seed. The greater species^v is most common in the gardens, and is known by the leaves being divided at the edge into five lobes, and being peltate, or having the petiole fastened to the middle of the leaf's surface; the petals are blunt at the end in this; whereas in the smaller sort^w the petals are sharp-pointed. The corols of both are large, and of a fine orange colour.

Tree Primrose, a Virginian plant, now so common in the European gardens, has a calyx of one leaf, cut into four segments, a corol of four petals, and a cylindric capsule of four cells, containing naked seeds. The broad-leaved sort^x, which is most common, has flat, lanced-shaped leaves, and a hairy stalk: the corol is of a fine yellow, shut usually during the day, but expanding in the evening; whence some call it *Nightly Primrose*.

Our European *Willow-herbs* are nearly allied to this, differing only in having a calyx of four leaves, and downy seeds. There is one sort common in old gardens called

^u *Tropæolum Lin.*

^v *Tropæolum majus Lin.*

^w *Tropæolum minus Lin.*

^x *Oenothera biennis Lin. Fl. dan. 4; 6. Mill. illustr.*

French Willow^y, with narrow lance-shaped leaves inclining to linear, irregularly set upon the stalk; irregular flowers, and stamens bent down. The hairy sort^z growing common in wet places, by ditches, hedges, and streams, and vulgarly known by the names of *Codlins and Cream*, or *Gooseberry Fool*, from the smell of the leaves when slightly bruised; has lance-shaped leaves, serrate about the edges, running down the stalk, the lower ones opposite: the stamens of this and of all our common species are upright, and the petals bifid. Four of the filaments are short, and the other four rise to the top of the tube of the corol, each four forming a regular square. I do not know whether it is generally so, but this year I could scarcely find any but what had been gnawn by insects; so that if I had not known the plant well, I should have been puzzled to determine even the class. The flowers are large, specious, and of a purple colour.

The heath genus contains no less than seventy-four species of lowly shrubs, which are by no means destitute of beauty, though the commonness of one species renders it contemptible^a. They all agree in these characters—a calyx of four leaves, inclosing the

^y *Epilobium angustifolium* *Lin.* Curtis, Lond. II. 24.

^z *Epilobium hirsutum* *Lin.* *ramosum* *Hudf.* Curtis, Lond. II. 21.

^a E'en the wild heath displays its purple dies.

germ; a corol of one petal, cut into four segments; the filaments inserted into the receptacle; the anthers bifid; and a capsule of four cells.

Common Heath^b which is so general a plant, that vast tracts of land take their names from it, is distinguished by the anthers being terminated with an awn, and lying within the flower, the style appearing beyond it, the corols bell-shaped, and not quite regular, the calyxes double, the leaves opposite and shaped like the head of an arrow. *Fine-leaved Heath*^c has crested anthers lying within the corol; the style hardly issues from it; the stigma is capitate; the flowers grow many close together; the corols are ovate and of a bluish colour; the leaves are produced in threes; and the bark is ash-coloured. *Cross-leaved Heath*^d has the anthers as in the first; the style lies within the corol; the flowers grow in a head; the corols are ovate; and the leaves are produced in fours: this grows in the wet and boggy parts of heaths, and is a handsome species. The foreign sorts, not being commonly met with, I shall not trouble you with them.

Mezereon, which you value for visiting you at a time when you have very few visitors,

^b *Erica vulgaris* Lin. Fl. dan. 677. Ger. 1380.

^c *Erica cinerea* Lin. Curtis, Lond. II. 25. Ger. 1382.

^d *Erica Tetralix* Lin. Curtis, Lond. I. 21. Ger. 1381.

and also for its pleasant odour, is of this class, and of the first order, as well as all the foregoing. It has no calyx, but a monopetalous, funnel-shaped corol, inclosing the stamens, and the border cut into four segments: the fruit is a roundish berry containing one seed. This species^e is distinguished from the rest of the *Daphne* genus by its sessile flowers, growing by threes from the same joint; and by its lance-shaped deciduous leaves. The corols are peach-coloured, deeper red, or white, and the berries of the two first are red, of the last yellow.

There is a sort^f not uncommonly wild in woods, and shady hedges, which is an evergreen, and has the flowers coming out by fives, from the *axæ*; the corols are of a yellowish green, and the leaves are lance-shaped. This is rather a dismal plant in respect of its situation, time of flowering, and colour of the corols; nor has it the same agreeable scent with the Mezereon: it is not however without its value, as an evergreen, and flourishing under the deep shade of trees. Both species are very hot and caustic in their nature; notwithstanding which, birds are greedy of the berries.

Yellow perfoliate Gentian^g is now removed

^e *Daphne Mezereum* *Lin.* Fl. dan. t. 268. Ger. 1403.

^f *Daphne Laureola* *Lin.* Spurge Laurel. Ger. 1404.

^g *Chlora perfoliata* *Lin.* Ger. 547.

from

from the other Gentians, to the second order of this class, because the number eight prevails in the stamens, calyx, and corol: in other circumstances it agrees with the genus in which it formerly ranged. It is found in pastures, on a chalky soil, and is easily known by its yellow corols, and upright smooth perfoliate stalks.

The third order has a large genus containing twenty-seven species, among which, besides other common plants, are *Bistort*, *Knot-grass*, *Buck-wheat*, and *Black Bindweed*.

Bistort^h has a single, undivided stalk, terminated by one spike of flowers; and lance-shaped leaves, generally hollowed at the base, running along the petiole, or forming a membrane along each side of it, and waved. The root is large for the size of the plant, and turns and twists in the ground.

*Knot-grass*ⁱ is a very common weed in places that are trod. The little flowers are produced from the *alæ* of the stalks, which are herbaceous, and trail upon the ground; the leaves are lance-shaped, and being of different size and breadth in different soils, have given occasion to the forming distinctions, which are but varieties.

Buck-wheat^k, which makes a pretty appear-

* Polygonum Bistorta Lin. Curtis, Lond. I. 22. and Mill. fig. pl. 66. Ger. 399.

ⁱ Polygonum aviculare Lin. Curtis, I. 27. Ger. 561.

* Polygonum Fagopyrum Lin. Ger. 89.

ance when cultivated, has heart arrow-shaped leaves, the stalk upright, though weak, smooth and unarmed, and the angles of the seeds equal.

*Black Bindweed*¹ is not very unlike this; but the leaves are heart-shaped, the stalk angular and twining, and the flowers obtuse. The anthers also are purple; and the base of the petioles is perforated beneath with a pore. This is not an unfrequent weed among corn.

All the species agree in having no calyx, a corol divided into five segments, that might easily be taken for a calyx; and one naked, angular seed.

The ninth class has not so many genera as the seventh, but it has many more species^m, and among them several very remarkable ones; as the Bay, Cinnamon, Cassia, Camphor, Benzoin and Sassafras, all comprehended under one genusⁿ; Acajou or Cashew Nut, and Rhubarb. The Bay genus has the following character: no calyx, but a corol resembling a calyx, and divided into six parts in most of the species; a nectary of three glands, each terminated by two bristles, surrounding the germ; the filaments in three rows, with two round glands near the base of the three

¹ Polygonum Convolvulus *Lin.* Curtis, Lond. IV. 29.

^m Twenty-eight: and only six genera.

ⁿ Laurus.

that form the inner row; the fruit an oval *drupe* or plum, inclosing a nut.

The true Bay^o is known by its lance-shaped, veiny evergreen leaves; the corol recedes from the general character in being quadrifid, or cut into four segments. It varies also in the number of stamens from eight to fourteen; and it recedes from the class in having incomplete flowers on separate plants. Linnæus however has kept it here because it has the essential characters of this genus, particularly the glands on the inner filaments. You will scarcely have the good fortune to meet with the other species, at least in flower.

Acajou or *Cashew*^p we know chiefly by the nut, which grows at the end of a fleshy body, as large as an orange, and full of an acid juice; this Linnæus calls the receptacle. Between the two shells is a thick, black inflammable oil, with which you may mark your linen, for it will not wash out. It also makes the finest black varnish. I need not caution you against putting this nut into your mouth to crack it. The oil is very caustic, and will raise blisters in the tongue. If it should ever be your fortune to see this

^o *Laurus nobilis*. Laurel is known only to modern times, and ranges in the class *Icosandria* under *Prunus*. Alexandrian Laurel is a *Ruscus* in class XXII.

^p *Anacardium occidentale* *Lin.*

tree in flower, you will observe that the calyx is five-leaved; that the corol consists of five reflexed petals; and that there are ten filaments, whence Linnæus first put it into the tenth class; but one of these being constantly without an anther, he afterwards removed it to the ninth. More recent observations however have ascertained that the *Anacardium* has perfect and stamiferous flowers on distinct individuals: it belongs therefore to the second order of the twenty-third class, *Polygamia Dioecia*.

These are of the first order, *Rhubarb* is of the second, *Trigynia*; there being no plants known of this class with two pistils. The characters of this genus are, a flower without a calyx; a corol of one petal, divided into six segments; and one large triangular seed, much like that of the Docks^a. No less than four species have been sent over and cultivated at different times under a notion of their being the true Tartarian Rhubarb. Of these the *Rhapontick*^r has migrated from the apothecary's shop into the kitchen, the petioles of the leaves being much esteemed for making of tarts. The leaves are smooth, of a roundish heart-shape, with the petioles thick, reddish,

^a They are both placed in the same natural order, namely the fifth division of the *Oleraceæ*.

^r *Rheum Rhaponticum* Lin.

a little channelled on their lower part, but flat at the top: the flower stems are red, grow from two to three feet high, and are terminated by thick, close, obtuse spikes of white flowers, coming out in June. This grows wild near the Pontic, Euxine or Black Sea.

There is good testimony for the three others being the true Rhubarb; and I think it not improbable but that they may all be cultivated in Tartary for their roots. One of these^s has longer leaves than the Rha-pontic, running more to a point, much waved on their edges, a little hairy on their upper side, and they appear much earlier; the petioles are not so much channelled on their under side, and are plain on the upper; they are also neither so red nor so thick: the flower stem is of a pale brownish colour, about four feet high, dividing into several loose panicles of white flowers, which appear in May.

Another^t has very smooth, shining, heart-shaped leaves, not running out so much to a point as the second, but more than the first; they are very broad towards the base, and a little waved and indented on their edges: the petioles have scarcely any channels, and are flat on their upper side;

^s Rheum Rhabarbarum *Lin.*

^t Rheum compactum *Lin.* Mill. fig. pl. 218.

they

they are pale green, and almost as large as those of the first sort. The flower-stem is pale green, five or six feet high, the upper part dividing into small branches, each sustaining a panicle of white flowers standing erect, and appearing the latter end of May.

A fourth sort, called *Palmated Rhubarb*^u, differs greatly from the others, and is known immediately by its palmated and very sharp-pointed leaves. The flower-stem is red, and six or seven feet high; the flowers are in loose panicles. Whatsoever may be the case with the other species, there is the most undoubted evidence of this being the true Tartarian Rhubarb.

There is one wild plant of this class, which is of the third order, having six styles. It grows in the water, and having handsome rose-coloured flowers, with long narrow leaves, is called *Flowering Rush*^v; the flowers are produced at the end of a naked stalk, in an umbel. They have no calyx, but a three-leaved involucre, a corol of six petals, and six capsules of one valve, gaping on the side towards the centre of the umbel, and containing many seeds.

The tenth is a much more considerable

^u *Rheum palmatum* *Lin.* Mill. illustr. Philos. Transf. 1765.

^v *Butomus umbellatus* *Lin.* Curtis, Lond. I. 29. Fl. dan. 604, Mill. illustr. Mor. f. 12. t. 5. f. penult. Ger. 29.

class,

class, having ninety-five genera, and five hundred and thirty-six species. The first order being very numerous, Linnæus has made a commodious subdivision of it into such as have corols of many petals, of one petal, or none; and the first of them he has subdivided again into such as have irregular and such as have equal corols. Most of those with irregular polypetalous flowers are very nearly allied to the papilionaceous tribe, with which you are already acquainted. Of these the most known are the *Judas-tree*, *Locust-tree*, *Flower-fence*, *Brasiletto*, all the numerous species of *Cassia*, *Balsam of Tolu-tree*, and *Nickar-tree*; mostly the produce of South America and the West Indies. *White Dittany* or *Fraxinella*^w is also of this subdivision, but not of the papilionaceous tribe.

This elegant flower is known by its five-leaved calyx; its corol of five spreading petals; the filaments set with glandulous points: it is succeeded by five connected capsules, containing two seeds covered with a common *aril*.

There is only one species of *Fraxinella*, varying in the colour of the flowers, which are either pale red striped with purple, or else white. It has pinnate leaves, somewhat resembling those of the Ash. The whole

^w *Dictamnus albus* Lin. Mill. fig. pl. 123.

plant emits an odour of lemon peel, but when bruised has a balsamic scent.

Among the plants with regular or equal polypetalous corols, you will find *Logwood*, *Melia* or the *Bead-tree*; *Guaiacum*, *Rue*, and *Dionæa Muscipula*, so curious for that sensitive quality of the leaves, by which it entraps insects that light upon them.

Rue is distinguished by these generic characters—a calyx divided into five parts; concave petals; ten honied pores at the base of the germ, which is raised on a receptacle punched with the same number of pores; and lastly, a capsule cut half way into five parts, consisting of five cells within, and containing many seeds. If I do not give you a caution respecting the common *Rue** of the gardens, you may probably be puzzled in examining its flowers; for there is only one flower on a branch which will answer to the generic characters; in all the rest you are to subtract one fifth from every part of the fructification. This circumstance is not peculiar to *Rue*, but is found in several other plants†, and has been made an objection by some to the Linnæan system. The illustrious author has extricated himself from

* *Ruta graveolens* *Lin.* *Mor. hist. f. 5. t. 14. f. 3.*

† As in *Cinchona*, *Myrsine*, *Euonymus europæus*, *Thesium alpinum*, *Herniaria fruticosa*, *Gentianæ* 23—27. *Linum Radiola*, &c.

the difficulty by forming his character upon the principal or primary flower, as he calls it, and announcing the anomaly. There are other plants, which in all the rest, *add* a fifth to the number of parts in the primary flower^z.

Garden Rue is specifically distinguished, partly by this circumstance, of having the side flowers quadrifid, and partly by the leaves being decompounded. There are some differences in this species: common garden Rue has the component lobes of the leaves wedge-shaped, and the stamens longer than the corol; another, also frequently cultivated has narrower lobes, the flowers in longer, looser bunches, and the stamens equal in length with the petals, the seed-vessel is also smaller; a third has the lobes of a linear shape.

Andromedas, Rhododendrons, Kalmias, Arbutus, and a few others, have regular monopetalous corols. The characters of the last are a very small calyx divided into five parts: an ovate corol pellucid at the base: and the fruit a berry, with the seeds lodged in five cells.

Strawberry-tree^a is known by its woody stem, its smooth leaves ferrate about the edges, and the cells of the berries having

^z Such as *Adoxa Moschatellina*, Curtis, Lond. II. 26. and some others.

^a *Arbutus Unedo* Lin. Mill. fig. pl. 48.

several seeds. Some of the other species have weak procumbent stems^b; and some have only a single seed to each cell^c. You are well acquainted with the *Arbutus*, by the ornament which it affords to your plantations in the latter months, with its lucid leaves thick covering the plant; and its bunches of flowers of this year, accompanied by the red round berries of the last.

But let not the first order of the tenth class occupy too much of your time, since there are four other orders contained in it. In the second you have all the *Saxifrages*, forty-two in number; agreeing in a calyx divided into five parts; a corol of five petals; a capsule of one cell, filled with many small seeds, and terminated by two beaks formed of the persistent styles. Of these, *Pyramidal Saxifrage*^d is esteemed for adorning halls and chimnies, with its beautiful pyramids of white flowers; which it will do for a long time. There are several varieties of it, but they have all stiff tongue-shaped leaves, with a cartilaginous serrate border, and collected into several rows close to the ground. From the midst of these

^b *Arb. acadiensis, alpina & uva ursi.*

^c *A. alpina & uva ursi.*

^d *Saxifraga Cotyledon Lin. Mill. fig. 243. Fl. dan.*

issues the stalk, sustaining the panicles of flowers.

Another species^e was also formerly much shown out at windows and balconies in smoky towns, and hence with its being really beautiful, had the names of *London Pride* and *None-so-pretty*, at a time when few plants were generally known. This has oblong or roundish leaves deeply notched on the edges springing from broad, flat, furrowed petioles, near two inches long. They surround the flowering stalk, which itself is destitute of leaves, of a red colour, stiff, slender, and hairy. The corols are white dotted with red.

Common White Saxifrage^f flowers early and in great quantities among the grass. The bottom leaves are kidney-shaped, hairy, and on pretty long petioles: the stalks are hairy, and in good ground a foot high, branching out from the bottom, and furnished with a few small leaves, in shape like the others, but sitting close to the stem: the flowers terminate the stalk in small clusters; the corols are white, and large for the size of the plant: if any doubt remains concerning it, pull it up, and you will find that the roots are like

^e *Saxifraga umbrosa* *Lin.* Mill. fig 141. f. 2.

^f *Saxifraga granulata* *Lin.* Mill. illustr. Curtis, Lond. I. 30. Ger. 841.

grains of corn, and of a reddish colour. In poor ground this plant is very small, and has only two or three flowers, sometimes but one, on a simple, unbranched stem.

These, with most of the other species, have upright stems, but there are three which have weak trailing stalks. Of these there is one which has much resemblance to a moss, when it is out of flower; and, from the manner of its growth in a thick tuft, it has acquired the English name of *Ladies' Cushion*^g. The leaves are linear, some entire and others trifid: the little flower stems are three or four inches high, slender, erect, and almost naked, terminated by small flowers of a dirty white.

The genus *Dianthus*, of this second order, is numerous, as well as the last, comprising twenty-two species, which agree in having a cylindric calyx of one leaf, surrounded at the base by four scales; a corol of five petals; and a cylindric, unilocular capsule, for a seed-vessel. Many of the species are beautiful, as *Sweet William*^h, the noble *Carnation*ⁱ, the *Pink*^k, with all its numerous varieties, the *China Pink*^l distinct from the former: several also of the sorts, which are wild in

^g *Saxifraga hypnoides* *Lin.* Fl. dan. 348. Mor. hist. f. 12. t. 9. f. 26.

^h *Dianthus barbatus* *Lin.*

ⁱ *Dianthus Caryophyllus* *Lin.* Mill. fig. 121.

^k *Dianthus plumarius* *Lin.*

^l *Dianthus chinensis* *Lin.* Mill. fig. pl. 81. f. 2.

many parts of Europe, though adorned with less splendid flowers, and more modest in their pretensions, are not however without their beauty. The *Carnation* is acknowledged, on all hands, for a worthy leader of one of the finest natural orders, entitled from the Latin name of this fragrant flower *Caryophylleous* plants. When we consider the size of the flower, the beauty of its colours, the arrangement of its parts, and above all the singularly rich and spicy odour that it exhales, we cannot withhold that tribute of admiration which will ever be given it, unless by obtruding itself too frequently on the eye, its real beauties become at length disregarded.

The leading feature, in distinguishing the species of this genus, is the *inflorescence* or manner of flowering. *Sweet William* and some others have aggregate flowers; *Carnation*, *Pink*, *China Pink*, &c. have many flowers on the same stalk, not however in herds, but solitary or separate; some few have one flower only on a stem; and two or three have shrubby stalks. The other circumstances that discriminate the species are, that the scales at the base of the calyx in the *Sweet William* are of an ovate-subulate form, and as long as the tube of the corol; in the *Carnation* and *Pink* they are subovate and very short; in the *China Pink* they are subulate, as long as the tube, and hang loose. The *Sweet William* has also lance-shaped leaves.

leaves. *Carnation* and *China Pink* have the petals notched. The *Pink* has the corols pubescent at the base, and the petals deeply cut. For ornament and beauty you will gather these flowers from your parterre; but as a botanist you will take them from a wall, or a dry untilled soil, where their simplicity and the clearness of their natural characters will make you full amends for the want of splendour. You would not always choose to be among full dressed people at a ball, or in a drawing-room; but sometimes to take a rural walk, and entertain yourself with plain country manners.

In the third order, besides some others, there are four genera containing many species which have a good deal of similitude. They are however thus well distinguished. *Arenaria* and *Stellaria* have a capsule of one cell; *Cucubalus* and *Silene*, a capsule of three cells: of the two former the first has the petals entire, the second has them bifid: of the two latter, in both of which the petals are bifid, the second has a crown composed of a set of minute petals, in the centre; whereas the first has nothing of this, or is naked. *Arenaria* and *Stellaria* have also a five-leaved calyx; in *Cucubalus* it is much inflated, and in *Silene* it is swelling. All four have five petals in the corol.

Spatling

Spatling Poppy^m is not an uncommon weed among corn and in meadows. You will know it by the almost round and much inflated calyx, beautifully veined, so as to have the appearance of a fine network thrown over it, and quite smooth; the corols are not entirely naked, and are pure white.

Sedums or *Stone-crops* are found in the fourth order (*Pentagynia*). They are known by the general prevalence of the number five in all parts of the flower: a calyx cut into five segments, a corol of five petals, five nectariferous scales at the base of the germ, and five capsules: not to mention the twice five stamens, and five styles, which form the characters of the class and order. Many of them are not uncommon in a wild state, particularly a small trailing sort with yellow flowers growing in a trifid cyme; and ovate, blunt, smooth leaves, imbricate and alternately adhering to the stalk:ⁿ other species have white, and some red corols. They grow chiefly on walls, or in very dry soils.

Cockle^o, which is so common a weed among corn, has a membranaceous, one-leaved calyx;

ⁿ *Cucubalus Behen* *Lin.* Fl. dan. 857. Mor. hist. f. 5. t. 20. f. 1. Ger. 678.

ⁿ *Sedum acre* *Lin.* Wall-pepper. Curtis, Lond. I. 32. Ger. 517. album 31. Ger. 512.

^o *Agrostemma Githago* *Lin.* Curtis, Lond. III. 27. Ger. 1087.

a corol of five obtuse, undivided petals, and an oblong capsule of one cell. The species is distinguished by the roughness of the plant; the length of the segments of the calyx, and by the petals being entire and naked.

Of *Lychnis* there are several species agreeing in these common characters. An oblong, smooth calyx of one leaf; a corol of five petals slightly bifid; and a one-celled capsule of five valves.

Scarlet Lychnis^p, commonly cultivated in gardens, has the flowers growing in bunches, so that the whole forms nearly a flat surface at top; the colour of the corol is a very high scarlet.

Catchfly^q, so called from the clammy juice exuding from the stalks under each pair of leaves, glutinous enough to entangle small flies, is known by the petals being almost entire; the colour of them is red: the leaves are long, narrow, and grass-like, especially the lower ones. The flowers of this and the foregoing are usually double in the gardens, and therefore useless to you in your botanical researches.

There is a sort of *Lychnis* commonly wild by water-sides and in moist meadows, called *Ragged-Robin*, *Meadow-Pinks*, *Wild-Williams* or *Cuckow-flower*^r, which has red jagged pe-

^p *Lychnis chalcedonica* Lin.

^q *Lychnis Viscaria* Lin.

^r *Lychnis flos cuculi* Lin. Curtis, Lond. T. 33. Ger.

tals, generally cut into four parts; and roundish capsules, the mouth of which has five teeth turning back. There is also another no less common in pastures, called *White Lychnis* or *White Campion*^s, which differs essentially from its congeners in having the pistils separate from the stamens, and on distinct plants. I leave you, dear cousin, with this irregularity, and wait a day of leisure to pursue our botanical career.

• *Lychnis dioica* Lin. Fl. dan. 792. Ger. 468.

LETTER XX.

June the 10th, 1775.

NOTHING difficult has hitherto occurred, dear cousin, in your determination of the classes, the number of the stamens alone having sufficed for that purpose. But no plant being yet discovered with eleven stamens, among those which have them distinct, the eleventh class should be expected to contain those plants which have twelve; but here the number is found to be by no means constant, and Linnæus is obliged to take into his class *Dodecandria*, all such plants as have from twelve to nineteen stamens inclusive. Nor is the eleventh class, with all this latitude, an easy one for a novice to determine; the number of stamens in some cases being fewer than twelve, in others more than nineteen, or else coming out in parcels at different periods. It is not very numerous, containing but thirty-three genera and one hundred and sixty-four species.

Of the first order, the most known or the most remarkable are *Asarum* or *Asarabacca*, the *Mangosteen*, *Winter's Bark*, *Purslain*, *Loosestrife*.

† *Brownea*, which has naturally eleven stamens, is of the sixteenth class, *Monadelphia*.

Asarabacca

Asarabacca has a calyx cut half way into three segments, and sitting on the top of the style: no corol: and a leathery capsule, of six cells within, and crowned at top. There are three species—the *Canadian*, the *Virginian*, and the *European*^v, which last is distinguished by two kidney-shaped leaves, ending bluntly.

Purslain has a bifid calyx inclosing the germ: a corol of five petals: and a capsule of one cell, in which the receptacle is loose; in some species it opens horizontally^v, in others it is trivalvular: the number of stamens varies in the different species. The *Purslain* cultivated for fallads^w, is a native of the hot parts of America; it is known by its wedge-shaped leaves, and the flowers sitting close to the stalk; and it is one of those which have the capsule opening horizontally.

Loosestrife has the calyx cut at the edge into twelve portions; and inclosing the germ: the corol of six petals, inserted into the calyx: the capsule bilocular, and containing many seeds. *Purple Loosestrife*^x is a handsome plant, adorning the banks of rivers, ponds and ditches with its fine spikes of

▪ *Asarum europæum* Lin. Fl. dan. 633.

▼ *Capsula circumscissa*.

▼ *Portulaca oleracea* Lin.

✱ *Lythrum Salicaria* Lin. Curtis, Lond. III. 28. Ger. 476.

purple flowers; the leaves grow in pairs, and are lance-shaped with a hollowed base; sometimes three leaves come out together from the same point, and the stalk is hexangular; but this is only an accidental variety. Our species answers to the character of the class, in having twelve stamens; but there are some which have but ten, nay even only six stamens.

In the second order are only two genera—*Heliochrysum*, an American plant, little known; and *Agrimonia*, an European, and sufficiently common. This has a small quinquefid calyx, sitting on the top of the germ, fortified with another: a corol of five petals, inserted into the calyx, and one or two roundish seeds in the bottom of the calyx. The number of stamens is very uncertain in this genus; some species having twelve, others ten, others seven. *Common Agrimonia*^y, which is found in woods and by hedge sides, has interruptedly pinnate leaves on the stalk, with the odd lobe at the end petiolate; the seeds are fortified with bristles. The outer calyx grows fast to the inner; and the stamens vary in number from twelve to twenty.

The third order has also only two genera, but they are numerous; *Reseda* having twelve, and *Euphorbia* no less than sixty-nine species. No genera are more difficult to determine

^y *Agrimonia Eupatoria* Lin. Fl. dan. 588. Mill. illustr. Ger. 712.

than these; the number and form of the parts varying in the different species. The essential character of the first consists in the trifid petals, one of them melliferous at the base; and in a capsule of one cell never closed but always open: the calyx also is of one leaf, cut into several narrow segments, two of which gape more than the others, on account of the melliferous petal; the stamens are from eleven to fifteen in number.

Dyer's-weed or *Weld*^z grows common in barren pastures, dry banks, and on walls; it is also cultivated for the use of the dyers^a. The leaves are lance-shaped, and entire, except that they have one indentation on each side at the base; and the calyx is cut into four segments. The corol also has three petals; the upper one melliferous, and divided half way into six parts; the opposite lateral petals are trifid; and sometimes two small entire petals are added below. *Dyer's-weed* is a biennial plant, producing the first year a circle of leaves close to the ground; and the next a stalk terminated by a long loose spike of yellowish flowers.

Sweet Reseda or *Mignonette*^b has oblong leaves, some of which are entire, and others trifid; the calyx of the flower is large, equal-

^z *Reseda Luteola* Lin. Fl. dan. 864. Ger. 489.

^a This is thought to be the plant with which the ancient Britons dyed their bodies.

^b *Reseda odorata* Lin. Mill. fig. 217.

ling the corol in size. The flowers are produced in loose spikes, on long peduncles; are of an herbaceous colour, and much esteemed for their agreeable odour, like that of fresh Raspberries.

Euphorbia has a corol of four, and sometimes of five petals, glandulous in most species, in some shaped like a crescent, or indented about the edges, in a few thin as a fine membrane; commonly placed as it were on the outside of the calyx, which is of one leaf, divided at the edge into four, or in some into five parts, and ventricose or swelling out. The stamens are twelve or more, issuing forth at different periods. The seed-vessel is a capsule of three distinct cells united, with one roundish seed in each cell, and on the outside smooth, rough or warted in the different species. This genus being so numerous, some subordinate distinctions are necessary; and accordingly Linnæus has divided it into seven sections. The first contains the *Euphorbiæ* properly so called; or such as have a shrubby, angular, spiny stem, generally void of leaves. The second contains the shrubby species without spines. In all the other sections, the stems are *dichotomous* or divide always by pairs, and the flowers are born in a kind of umbel: which, in the third section, is commonly *bifid*; in the fourth, *trifid*; in the fifth, *quadrifid*; in the sixth, *quinquefid*; and in the seventh *multifid*.

Several

Several species of the first section yield indifferently that acrid milky juice, which when inspissated is sent us under the title of *Euphorbium*. The flowers are of little beauty, and these plants have been noticed rather for the singularity of their form, and the striking difference of their structure from the plants of Europe, than for any charms that they possess. The species supposed to be that from whence the ancients had the drug^c, is known by a triangular, jointed stalk: the species from which it is said we now have it^d, has a quadrangular stem, and double spines: and the species which Linnæus supposes ought to be used^e, is multangular with double spines.

Medusa's-head^f is of the second section. The stalks are closely covered with tubercles, lying over each other, and from the sides of these spring many branches which are frequently so entwined as to give the idea of a parcel of serpents. The ends of the branches have narrow succulent leaves readily dropping off, and a set of white flowers.

The plants of the other sections are commonly known by the name of *Spurge*, and are most of them wild in the different parts

- ^c *Euphorbia antiquorum* Lin. Comm. hort. 1. t. 12.
- ^d *Euphorbia canariensis* Lin. Comm. hort. 2. t. 104.
- ^e *Euphorbia officinarum* Lin. Comm. hort. 1. t. 11.
- ^f *Euphorbia Caput Medusæ* Lin. Comm. hort. 1. t. 17.

of Europe. Two species are common weeds in kitchen gardens: one of them^s belongs to the fourth section, or those which have trifid umbels: the subdivisions of these are dichotomous: the *involucellæ* or *bractes* are ovate; and the leaves are quite entire, or without any notches about the edge; they are ovate in form, and attached to the stalk by short petioles; each petal also has two little horns; the other^b is of the sixth section, having quinquèfid umbels; each principal division subdivides into three; the *involucellæ* are shaped, as in the former; the leaves are wedge-shaped, and serrate about the edges; and the petals are round and entire. A third speciesⁱ, common in woods, is of the last section, with multifid umbels: it is a larger plant, and perennial; whereas the others are annual: the *involucellæ* are round and perfoliate; the leaves are very blunt at the end.

Spurges having little beauty, they are seldom cultivated in gardens. One of the most common is a biennial species, of the fifth section, with the leaves opposite and quite en-

^s Euphorbia Peplus. Petty Spurge. Curtis, Lond. I. 35. Ger. 503.

^b Euphorbia helioscopia. Lin. Sun Spurge. Curtis, Lond. I. 36. Ger. 498.

ⁱ Euph. amygdaloides Lin. Wood Spurge. Mor. hist. f. 10. t. 1. f. 1. Ger. 500.

tire, called *Broad-leaved Spurge*, or *Catapuntia*^k. Its native place is Italy, and the south of France: it grows three or four feet high; the flowers are of a greenish yellow, and the capsules being very elastic, the seeds are thrown to a considerable distance. A second is perennial, and of the last section^l; the *involucellæ* are heart-shaped; the petals are formed like a crescent; and the capsules are smooth; some of the branches are barren, and others bear flowers and seed; on the first the leaves are narrow and setaceous; on the second they are lance-shaped.

There is a genus^m of this class in which the number twelve prevails in all the parts. Having twelve styles, it is of the order *Dodecagynia*. The calyx is divided into twelve parts; the corol consists of twelve petals; and the flower is succeeded by twelve capsules, containing many small seeds. *Common Houseleek*ⁿ is one of these, which, though so succulent a plant, flourishes on walls and roofs. The edges of the leaves are set with short fine hairs; and they do not grow in a globular form, as some other species do, but spread

* *Euphorbia Lathyris* Lin.

^l *Euphorbia Cyparissias* Lin.

^m *Sempervivum*, nearly allied to the *Sedums* in the tenth class.

ⁿ *Sempervivum tectorum* Lin. Curtis, Lond. III. 29. Mill. illustr. Ger. 510.

open.

open. From the centre of the heads of leaves arises a round, red, succulent flower-stalk, about a foot high, which at bottom has a few narrow leaves, and at top divides into two or three parts, each supporting a reflexed range of flowers, with red corols. Though the natural number in this genus be twelve; yet you will find it to vary exceedingly: nature being less constant in larger than in smaller numbers. With this short sketch, adieu, dear cousin, for the present.

LETTER XXI.

June the 21st, 1773.

YOU have already, dear cousin, taken an imperfect view of the twelfth class, as far as it relates to fruit-trees^o: you are not however to suppose, either that all these trees range in the class *Icosandria*, or that no other but them are to be found there. No less than twenty-nine genera, and two hundred and ninety-four species are included in this class, a considerable portion of which is trees or shrubs; many herbs however are found among them.

To distinguish this class and the next from the rest, and from each other, remember always that it is not the number, but the situation of the stamens which furnishes the classical character. In the next they arise, as generally in the other classes, from the receptacle; but in this they spring either directly, or with the parts of the corol, from the calyx, which is of one leaf, and not flat but hollow: the corol is most frequently of five petals.

Of the first order, *Cactus* is a very considerable genus, comprising the *Melon-thistles*, *Torch-thistles* or *Cereuses*, and the *Opuntias* or *Indian Figs*. These all agree in a calyx,

^o In letter VII.

whole at the bottom, but yet consisting of several rows of leaves, and placed on the top of the germ: in a corol which is double, or formed of several rows of petals: and in having a berry containing several seeds in one cell.

The *Melon-thistles* are roundish bodies, without either leaf or stalk. The *Torch-thistles* have a long stem without leaves, which in many species is strong enough to support itself; but in some trails along the ground, or is supported by trees: these last are called *Creeping Cereuses*. *Opuntias* are composed of flat joints connected together.

These are all remarkable for a structure different from that of other plants; but some of the *Cereuses* are much esteemed for the beauty of the flowers, which are perhaps the more noticed, because they are the less expected from plants whose appearance is so unpromising. Those of the *Great-Flowering Creeping Cereus*^p are near a foot in diameter, the inside of the calyx of a splendid yellow, and the numerous petals of a pure white: hardly any flower makes so magnificent an appearance, during the short time of its duration, which is one night only; for it does not begin to open till seven or eight

^p *Cactus grandiflorus* Lin. Mill. fig. pl. 90.

o'clock in the evening, and closes before sunrise in the morning, unless it is gathered and kept in the shade, by which means I have prevented it from closing till about ten. This noble flower opens but once; but when, to the grandeur of its appearance, we add the fine perfume which it diffuses, there is no plant that more deserves your admiration. When it is not in blow, you will know it by the creeping stem, marked longitudinally with about five prominences.

Another species of *Creeping Cereus*^a is more common, but scarcely less admirable for the beauty of its pink-coloured flowers, which the plant produces in greater quantity; they are also of longer duration, for they not only boldly show their face to the sun, but will even keep open three or four days. When it is not in flower, this species is distinguished by its very slender branches, covered with spines, and marked with ten prominencies. But you are well acquainted with this fine plant, which requiring little heat, forms one of the principal ornaments of your dressing room, in the month of May.

There are many species of *Opuntia*, *Indian Fig*, or *Prickly Pear*, all natives of America, and kept rather for their singularity than their beauty, having no leaves, but a flat

^a Cactus flagelliformis *Lin.* Ehret. pict. t. 2. Trew. Ehr. t. 30.

jointed stalk, set with knots of prickles, bristles, or both. The *Cochineal Fig*^r, on which the insect of that name feeds, is the only one that is unarmed: this has oblong joints; the common sort^s has roundish joints, with brushes of bristles, but no prickles.

In this same order you will find the *Syringa*^t. The natural number in the calyx, corol, and capsule is four; but sometimes it is five. The taste of the leaves like cucumbers, and the odour of its white flowers, like those of the orange, sufficiently distinguish this well known shrub from all others. The slight indentations about the edges of the leaf separate it from another species, which has none.

Here too will you find your favourite *Myrtle*, which has a calyx sitting on the top of the germ, and generally cut into five segments; a corol of five petals; and a berry for a fruit. Some species however have a quadrifid calyx, and then the corol has four petals: others have an entire undivided calyx. The *Common Myrtle*^u, of which there are many varieties, has the flowers coming out singly, and an *involucre* of two leaves upon the peduncle.

^r *Cactus cochinillifer* *Lin.* Dill. elth. t. 297. f. 383.

^s *Cactus Opuntia* *Lin.* Mill. fig. t. 191.

^t *Philadelphus coronarius* *Lin.*

^u *Myrtus communis* *Lin.* Mill. fig. 184.

In the second order there is only the *Cratægus*, a genus comprehending several species of *Thorn*, and also two trees, the *Aria* or *White Beam Tree*^w and the *Maple-leaved Service*^x. The generic characters are, a calyx cut into five segments, and sitting on the top of the germ; a corol of five petals; and a berry containing two seeds. The first of the trees is readily known by the ovate shape of the leaves, with very prominent transverse veins, and unequal serratures about the edges; but particularly by the hoariness of their under surfaces: the second, by its leaves cut into many acute angles like those of the Maple; the divisions are five or seven; and the lowest lobes stand wider than the others. *Cockspur Hawthorn*^y has the leaves ovate, and so deeply ferrate, as to be almost lobate. *Virginian Azarole*^z has oval leaves, wedge-shaped at the base, shining and deeply ferrate. *Common Hawthorn* or *White-thorn*^a, whose flower has obtained the name of *May*, from the month in which it appears, has obtuse leaves, cut into three principal parts, and those ferrate. *True Azarole*^b has leaves like

^w *Cratægus Aria* *Lin.* Mill. illustr. Ger. 1327.

^x *Cratægus torminalis* *Lin.* Ger. 1471. Fl. dan. 798.

^y *Cratægus coccinea* *Lin.* Mill. fig. 179. Angl. hort.

t. 13. f. 1.

^z *Crat. Crus-galli* *Lin.* Mill. fig. 178. 2.

^a *Cr. Oxyacantha* *Lin.* Fl. dan. 634. Ger. 1327.

^b *Cr. Azarolus* *Lin.*

the foregoing, but larger, paler, and with broad lobes: the flowers and fruit are also much larger. All these you will find in your plantations: as you will also two trees that are in the third order, under the genus *Sorbus*; viz. the *Mountain Ash*^c and the *Service*^d; both which have pinnate or winged leaves, like the Ash; smooth on both sides in the first, but villous on the under surface in the second; these also have the lobes broader, and not so much serrated. Their common characters are a quinquefid calyx, a pentapetalous corol, and an inferior berry with three seeds.

The fourth Order (*Pentagynia*), besides the *Apple*, *Pear*, and *Quince*, comprehended under one genus, *Pyrus*, has the *Medlar* with many other species of trees or shrubs in a second^e; and all the shrubs called *Spiræa*, in a third. These genera agree in a quinquefid calyx, and a pentapetalous corol; the germ is inclosed within the flower in the last; but is beneath it in the rest: the fruit is the principal distinction; in *Pyrus* it is a *Pomum*—in *Mespilus* a *Berry*—in *Spiræa* a set of *Capsules*.

This order boasts a large and splendid genus of herbaceous succulent plants, called

^c *Sorbus aucuparia* Lin. Mill. illustr. Ger. 1473.

^d *Sorbus domestica* Lin. Edw. av. t. 211. Ger. 1474.

^e *Mespilus* Lin.—*germanica*. Medlar. Ger. 1453.

Ficoides or *Fig Marigolds*^f. Fifty species all consent in a quinquefid calyx on the top of the germ; a multifid corol of narrow linear petals: and a fleshy capsule divided into cells corresponding with the number of styles, and containing many seeds. Though most of the species have five styles, yet some have only four, and others have ten. This large genus is subdivided into three sections, from the colour of the flowers, which being striking and permanent, may here very well furnish such a distinction, though it is in most cases a circumstance not to be depended on. The corols then, which are specious, very large, and double, are in the first section *white*, in the second *red*, and in the third *yellow*. The different forms of the succulent leaves afford, almost of themselves, sufficient specific distinctions.

The most known species is that which is called *Diamond Ficoides*, or more commonly *Ice Plant*^g. This has ovate, alternate, waving leaves, with white corols; but it is chiefly regarded for the singularity of being covered with pellucid pimples, in the sun appearing like crystalline bubbles. *Egyptian Kali*^h, esteemed for making the best

^f *Mesembryanthemum Lin.*

^g *Mesembryanthemum crystallinum Lin. Dill. elth. t. 180. f. 221. Bradl. succ. 5. t. 15. f. 48.*

^h *Mesem. nodiflorum Lin. Mor. hist. 2. f. 5. t. 33. f. 7.*

pot-ash, is also of this genus; has alternate, roundish, obtuse leaves, ciliate at the base, and white corols.

Of the last order of this class the *Rose* is a genus universally known; and, were it less so, would hold the first rank in the admiration of mankind. The distinctive characters are, a quinquefid calyx; a pentapetalous corol; and a kind of pitcher-shaped, fleshy berry, formed out of the calyx, terminated by the divisions of it, and containing several oblong, rough seeds, growing to the calyx on every side. The species are distinguished by the globose or ovate form of the fruit, by the situation of the spines on the different parts of the shrub, the inflorescence, &c. The *Sweet-Briar*ⁱ has globose fruits beset with crooked spines, and the leaves rubiginous or rusty underneath. The *Dog-rose* or *Wild Briar*^k has ovate fruit, but smooth, as are also the peduncles; the stalk however and the petioles are spinous, the petals are blush coloured and bilobate, and there are two ciliate bractes, opposite each other, to every flower.

Strawberry, with all its various fruits, constituting only one species^l, is of this order. Here, though the corol has only

ⁱ *Rosa rubiginosa* *Lin.* Fl. dan. 870. Ger. 1272.

^k *Rosa canina* *Lin.* Fl. dan. 555. Ger. 1270.

^l *Fragaria vesca*. *Lin.* Mor. hist. f. 2. t. 19. f. 1. Ger.

five petals, the calyx is cut into ten segments, alternately larger and smaller, and the seeds are dispersed over the surface of a roundish, pulpy receptacle, vulgarly called a berry. These are the generic characters. All the eatable Strawberries increase by runners; and by this circumstance they are sufficiently distinguished from the barren sort^m, which not only has a dry juiceless receptacle, but never throws out any of these runners.

The thirteenth class, *Polyandria*, has many stamens to the flowersⁿ as well as the foregoing, but springing from the receptacle, along with the pistil. These two classes united would have formed too large a class for commodious examination; a difficulty to be avoided certainly in all cases where we can: besides, the plants contained in the one, are in general so different, both in their form and qualities, from those of the other, that it would have been a pity to intermix beings so discordant, or to unite in the same class fruits which are so pleasant to the palate, and wholesome to the constitution; and herbs destructive to the human frame from their poisonous qualities; as many of those in the class *Polyandria* are known to be.

^m *Fragaria sterilis* Lin. Curtis, Lond. III. 30. Ger. 998.

ⁿ From 20 to 1000.

In the first order (*Monogynia*) you will find the *Poppy*, which is sufficiently distinguished by a calyx of two leaves^o; a corol of four petals; and a one-celled capsule, crowned with the stigma, under which it opens with many holes, to give exit to the numerous little seeds. Of this genus, four species have rough, and five have smooth capsules. The common *Corn Poppy*^p; the species used in medicine, and which yields the *Opium*^q; the *Welch Poppy*; and the *Oriental fort*, now introduced as an ornament to the flower garden^r, are all of the latter division. The first has the capsules almost globose; the stalk covered with hairs, and sustaining several flowers of a fine high scarlet; and the leaves pinnatifid and cut. The second has the calyx smooth, as well as the capsule, the leaves cut and embracing the stalk: that which is cultivated in the fields has white corols, and oblate spheroidal heads as big as an orange, with white seeds: the garden fort has purplish corols, very dark at the base, with smaller oblong heads and black seeds: this varies much in colour, and has sometimes very large and very double

^o This falls off spontaneously when the flower expands.

^p *Papaver Rhæas* *Lin.* Curtis, Lond. III. 32. Ger. 371.

^q *Papaver somniferum* *Lin.* Blackw. t. 483. Ger. 370.

^r *Papaver orientale* *Lin.* Tourn. itin. 3. t. 127. Comm. rar. t. 34.

flowers,

flowers, then resembling an immense Carnation. Some persons are of opinion that the field and garden Poppy are different species; Linnæus makes them but one: I have given you the differences, but do not take upon me to decide. The capsules of the *Welch Poppy*^s are oblong; the stalk smooth; the leaves winged and cut: the corols large and yellow. The *Oriental Poppy* has rough leafy stalks, supporting one large, single, red flower; the leaves are winged; and serrate about the edge. All the species of Poppy have a strong disagreeable smell.

The *Caper*^t is of this first order; so is the *Tea-tree*, and the *Lime*^u; the *Water-Lilies*, both *yellow*^v and *white*^w, spreading their broad leaves on the surface of slow-moving streams and stagnant pools, and raising their ample many-petalled corols above it. Here also is the numerous and beautiful genus *Cistus*, known by a calyx of five leaves; two of which are less than the other three; a corol of five petals; and a capsule for a seed-vessel. Of these there are forty-nine species, most of them shrubs, but some herbaceous; the corols purple, white or yellow in the different sorts.

^s *Papaver cambricum* Lin. Dill. clth. t. 223. f. 290.

^t *Capparis spinosa* Lin.

^u *Tilia europæa* Lin. Fl. dan. 553. Ger. 483.

^v *Nymphæa lutea* Lin. Fl. dan. 603. Ger. 819.

^w *Nymphæa alba* Lin. Fl. dan. 602. Ger. 819.

Peony is of the second order, which is a small one; the characters of the genus are a calyx of five leaves, a corol of five petals, and two or three germs, crowned immediately with stigmas, without the interposition of any styles.

This, and some plants of the following orders, are strictly united by one natural bond, under the name of *Multifloræ* or *Many-podded*; having a fruit composed of several pericarps joined together. They agree likewise in having either no calyx, or at least one very apt to fall off; a polypetalous corol, and stamens exceeding the petals in number. Of these you are acquainted with the *Larkspur* and *Aconite*, belonging to the third order; the *Columbines* to the fifth, and *Hellebore* to the last. None of them have any calyx; and they have all a corol of five petals: the nectaries form the principal distinction of the genera. This in *Larkspur* is bifid, sessile, and continued backwards into a horn or spur. *Aconite* has two recurved, pedunculate nectaries. *Columbine* has five of these horn-shaped nectaries, between the petals. *Hellebore* has many short, tubulous nectaries, placed in a ring round the outside of the stamens, each divided into two lips at top. *Larkspur* has also either one capsule or three, and the garden species *

* *Delphinium Ajacis* Lin.

is distinguished by its simple unbranched stem from the wild one^y, which has it subdivided: these both have the nectary of one leaf; in *Bee Larkspur*^z and the rest it is of two. *Aconite* has the upper petal arched; and three or five capsules. You have one species common in your flower borders and plantations, with long spikes of large blue flowers, called *Monk's-hood*^a; this is one of the species that have three capsules to a flower; and the leaves are multifid, with linear divisions, broadest at top, and marked with a line running along them. *Wholesome Wolfsbane*^b, as it is called, has five capsules, five styles, and the flowers are sulphur-coloured. *Columbine* has five distinct capsules: the common sort^c has bent nectaries: in its wild state the flowers are blue, the petals short, and the nectaries very prominent; in the garden you observe not only a variety of colours, but that the petals are excluded, and the nectaries much multiplied. *Hellebore* has sometimes more than five petals to the

^y Delphinium Consolida Lin. Fl. dan. 683. Ger. 1083.

^z Delphinium elatum Lin. Mill. fig. 250. f. 2.

^a Aconitum Napellus Lin. Mill. illustr. Jacq. austr. 4. 381.

^b Aconitum Anthora Lin. Mill. fig. pl. 12. Jacq. austr. 4. 382.

^c Aquilegia vulgaris Lin. Fl. dan. 695. Mill. illustr. Ger. 1093.

corol:

corol: and always several capsules succeeding to each flower; these contain many round seeds, fixed to the suture of the capsule. The winter-flowering species, commonly called winter *Aconite*^d, is the only one that drops its petals; it bears one yellow flower sitting on the leaf. *True Black Hellebore* or *Christmas Rose*^e has one or two large white flowers upon a naked stalk, and fleshy pedate leaves. *Stinking Black Hellebore* or *Bear's-foot*^f sustains many greenish flowers on one stalk, and pedate leaves on the stem, but none towards the root. This is not uncommonly wild, and you will find it flowering during winter under the trees in your plantations. Caution your poor neighbours against being too free in giving their children this plant against worms; for in too large a dose it is certainly dangerous. Indeed all the herbs just now described are more or less poisonous: *Aconite* is known to be highly so.

The last order of this class, *Polyandria*, contains also the *Tulip-tree*, which has a triphyllous calyx, six petals to the corol, and many lance-shaped seeds lying one over another, and forming a sort of *strobile*. This tree is remarkable for the shape of its leaves, having the middle lobe of the three truncate,

^d *Helleborus hyemalis* *Lin.* Curtis, bot. mag. 3.

^e *Helleborus niger* *Lin.* Curtis, bot. mag. 8.

^f *Helleborus fœtidus* *Lin.* Blackw. t. 57. Ger. 976.

or cut transversely at the end. The flowers are large and bell-shaped; the petals marked with green, yellow, and red spots^g. Here also are the *Magnolias*, which have a calyx of three leaves like the last, but a corol of nine petals; the fruit is a *strobile* or scaly cone of bivalvular capsules, covering a club-shaped receptacle, each capsule containing a roundish seed, like a berry, hanging out by a thread. It is to be lamented that these fine trees, so beautiful both in leaf and flower, will not bear all the rigour of our climate.

This order boasts two numerous genera, much esteemed among the florists—the *Anemone* and *Ranunculus*. The first has no calyx; a corol of two or three rows, with three petals in each row: and many naked seeds, retaining each their style. You are now too far advanced in the science, to need a caution against taking the fine flowers of your beds, upon which the gardener so much values himself, in order to examine the corol of the *Anemone*; they are the children of art, not of nature, which we are studying. The early *Hepatica*^h is of this genus; and is known by its three-lobed entire leaves.

^g *Liriodendron Tulipifera* *Lin.* Trew. Ehr. t. 10. Catesb. car. 1. t. 48.

^h *Anemone Hepatica* *Lin.* Curtis, bot. mag. 10. Fl. dan. t. 610.

It is the only species which has any thing like a calyx; for it has a *perianth* of three leaves, which being remote from the flower, is rather an *involucre* than a calyx. The *Pasque-flower*ⁱ, so called from its flowering about Easter, is also of this genus: it adorns some of our dry chalky hills with its beautiful bell-shaped, purple flowers; and though it has no calyx, properly so called, yet the flower-stalk has a leafy multifid *involucre*; and the leaves are doubly winged, or *bipinnate*. Each plant bears but one nodding flower; and after that is past, the top of the plant is hoary with the tails, which adhere to the seeds. Another wild sort is the *Wood Anemone*^k, bearing only one white or purplish flower on a plant; the leaves are compound, with cut lobes; and the seeds are pointed, but without tails. The garden Anemones, which are so ornamental to the flower-garden in the spring, are only of two species, notwithstanding the great variety of their colours; red, white, purple, blue, with all the intermediate shades, and innumerable variegations of them. Art, to

ⁱ *Anemone Pulsatilla* Lin. Relh. Fl. cantab. p. 208. Fl. dan. 153. Ger. 385.

^k *Anemone nemorosa* Lin. Curtis; Lond. II. 38. Fl. dan. 549. Ger. 383.

increase

increase their beauty, has rendered them very large and double; but we can still distinguish the species by their leaves, which in one^l are decomposed, dividing by threes; in the other^m digitate: the stalk is leafy; and the seeds are tailed, in both species. The rival genus of the Anemone is the *Ranunculus*, which differs from it in having a calyx of five leaves, and a corol of five petals: but the distinguishing mark of this genus is a honied gland just above the base of each petal, on the inside. Of forty-four species many are wild; and some extremely common in most parts of Europe, under the name of *Butter-flowers*, *Butter-cups*, and *King-cups*. Three sorts particularly, which at one season cast a yellow veil over our meadows, are generally confounded and looked upon as one. However the *bulbous*ⁿ has the calyx bent back to the flower-stalk, whereas in the *creeping*^o and *acrid*^p it is open or spreading: in the first and second the peduncle is furrowed; in the third it

^l *Anemone coronaria* *Lin.* Mill. fig. pl. 31.

^m *Anemone hortensis* *Lin.*

ⁿ *Ranunculus bulbosus* *Lin.* Curtis, Lond. I. 38. Ger. 95.

^o *Ranunculus repens* *Lin.* Curtis, Lond. IV. 38. Ger. 95.

^p *Ranunculus acris* *Lin.* Curtis, Lond. I. 39. Ger 95.

is round, without any channelling: besides this, the leaves are very different upon inspection; and the first has a bulbous root, the second throws out abundance of runners which strike root like those of the strawberry, and the third is a taller, genteeler, later-flowering plant. But not the meadows only are filled with *Ranunculi*; the woods^q, the corn-fields^r, the waters^s, have also their share of them. One species, which flowers in moist meadows very early in the spring, is so distinct from its fellows, that some botanists have not scrupled to remove it from this genus, to form one by itself: for it has a calyx of three leaves only; but, to make amends, a corol of more petals than five: it has heart-shaped, angular, petiolate leaves, one flower on a stalk, and tuberous or knobby roots^t. But the *Persian Ranunculus*^u is the great rival of the Anemone, in the flower-garden, for the beauty and variety of the large, double corols; which are so changed

^q *Ranunculus auricomus* *Lin.* Curtis, Lond. II. 41. Ger. 954.

^r *Ranunculus arvensis* *Lin.* Fl. dan. 219. Ger. 951.

^s *Ranunculus sceleratus, hederaceus, aquatilis, &c.* *Lin.*—*sceleratus.* Curtis, Lond. II. 42. Ger. 962,—*hederaceus*, IV. 39. Ger. 830. Fl. dan. 321,—*aquatilis.* Ger. 829. Fl. dan. 276.

^t *Ranunculus Ficaria* *Lin.* Lesser Celandine. Curtis. Lond. II. 39. Ger. 816.

^u *Ranunculus asiaticus* *Lin.* Mill. fig. 216.

by art, that you must have recourse, for the specific distinction, to the leaves; these are ternate, and biternate, the lobes trifid and cut. The stalk is erect, round, hairy, and branching at bottom: the radical leaves are simple. With all this employment as a botanist, and amusement as a florist, I leave you, dear cousin, for the present.

L E T T E R XXII.

July the 1st, 1775.

HAVING now finished more than half our course, we are arrived at a set of natural classes, with which you are so well acquainted, as to find no difficulty in assigning the proper place to any plant belonging to them.

The structure of the flowers in the fourteenth class was explained at length in the fourth letter: but the proper and essential character of it is, the having four stamens, all in one row, and in pairs; the inner pair longer than the other, whence the name *Dynamia*; and one style: all included within an irregular monopetalous or ringent corol.

This class has only two orders; which are not founded upon the form of the flower, as you might be led to suppose from what was said in a former letter; nor upon the number of the styles, as in the foregoing classes, because none of the flowers have more than one; but upon the circumstance of having four naked seeds, bosomed in the calyx; or else many fixed to a receptacle in the middle of a pericarp: the first of these is called *Gymnospermia*, the second *Angiospermia*.

This

This class contains one hundred and two genera, and six hundred and forty-three species; and each order forms a natural one—the first including the *Verticillate* plants, so called from the manner in which the flowers grow, in *verticilli* or *whorls*: they also agree in producing the leaves by pairs, and in having the stalks square. The second comprising the *Personate* flowers; or such as have mostly a personate corol, but always a pericarp, or vessel inclosing the seeds.

The essential generic character of *Ground Ivy*^v is at the same time beautiful and extremely distinctive, each pair of anthers forming an elegant little cross, one above the other. The leaves are kidney-shaped, and notched about the edges. In this genus, in Hyssop, Mint, Lavender, Bugle, Betony, Dead-Nettle, Cat-Mint, Savory, Horehound, &c. the calyxes are pretty regularly quinquefid. In Thyme, Basil, Self-heal, Marjoram, Baum, &c. they are bilabiate. In *Mint* the corols are hardly ringent; the filaments are straight and distant. *Lavender* has the corols, as it were, turned *topsyturvy*; that which is the upper part in most others being the lower in this, and *vice versa*; the calyxes also are supported by a *bracte*; and the stamens lie within the tube. *Teucrium* has no proper upper lip, but the corol is slit

^v *Glechoma hederacea* *Lin.* Curtis, Lond. II. 44. Ger. 856.

quite through for the stamens to pass. *Bugle* has the upper lip of the corol remarkably short, much shorter than the filaments; our common wild species^w is known by its smoothness, and increasing by runners. *Betony* has the upper lip of the corol flattish and rising, with a cylindric tube; the segments of the calyx are prolonged into narrow thin points like awns; and the filaments extend not beyond the neck or opening of the tube. *Wood Betony*^x is distinguished by an interrupted spike, and by the middle segment of the lip being emarginate, or having one notch. *Cat-mint* has the middle division of the lower lip crenate, or slightly notched; the edge of the chaps reflexed; and the stamens close. The flowers of the wild species^y are in a spike, consisting of a set of whorls on short peduncles; the leaves are heart-shaped, bluntly serrate and petio-late. If you have any doubt concerning this plant present it to puffs, and she will inform you by the caresses which she bestows upon it, in common with Marum and Valerian; the first of which not growing wild, and the second being so very different a plant, she cannot lead you into an error. *Black Horebound* and *White Horebound* have both a calyx

^w *Ajuga reptans* Lin. Curtis, Lond. II. 43 Ger. 631.

^x *Betonica officinalis* Lin. Curtis, Lond. III. 32. Ger. 714.

^y *Nepeta Cataria* Lin. Fl. dan. 580. Mor. hist. f. 11. t. 6. f. 1. Ger. 682.

marked with ten streaks; but the upper lip of the corol, in the former, is arched and crenate: in the latter straight, linear, and bifid. *Common Black Horebound*^z is known by its whole, heart-shaped, ferrate leaves, and sharp-pointed calyxes: the corols are red. *Common White Horebound*^a has the divisions of the calyx ending in setaceous hooked points: the corols are white, and the whole plant has a white appearance from the nap that covers the stalks and leaves.

Of the second division with bilabiate calyxes, *Thyme* has the opening of the tube closed with hairs. *Wild Thyme*^b that smells so gratefully, and adorns dry sheep pastures with its red flowers, is known by these flowers growing in a head; by the divisions of the calyx being ciliate; the leaves ovate, flat, blunt at the end, dotted with little glands, and ciliate at the base; and by its creeping stalks. *Garden Thyme*^c is an erect plant, with its ovate leaves revolute, and the flowers in a set of whorls, all together making a spike. Of this there are several varieties, as there are also of the other. *Basil* has an *involucre* of many narrow leaves immediately

^z *Ballota nigra* Lin. Blackw. 136. Mor. hist. f. 11. t. 9. f. 14. Ger. 701.

^a *Marrubium album* Lin. Blackw. 479. Moris, t. 9. f. 1. Ger. 693.

^b *Thymus Serpyllum* Lin. Curtis, Lond. II. 47. Mor. hist. t. 17. f. 1.

^c *Thymus vulgaris* Lin.

under the whorl of flowers. *Marjoram* is distinguished by an *involucre* composed of ovate, coloured, imbricate *bractes*, forming all together a square kind of spike or *strobile*. *Wild Marjoram*^d has the spikes rounded at the corners, conglomerate, and all together forming a panicle; the bractes longer than the calyxes. You will find this wild under hedges, and among bushes. That which is in the kitchen garden, under the name of *Pot Marjoram*^e, differs not greatly from the next: the spikes are oblong, aggregate, and hairy; the leaves heart-shaped, and nappy; the stem woody, and the flowers white. *Sweet Marjoram*^f has ovate leaves, blunt at the end, and roundish compact pubescent spikes. *Winter Sweet Marjoram*^g has long, aggregate, pedunculate spikes, and the bractes the length of the calyxes. The corols of this are white; of the other red. *Dittany of Crete*^h has the small purple flowers collected in loose, nodding heads, with imbricate bractes; the stalks are pubescent, purplish, and send out small branches from their sides by pairs; the leaves are round, thick, and so woolly as to be quite white;

^d *Origanum vulgare* *Lin.* Fl. dan. 638. Mor. hist. f. 11. t. 3. f. 12. Ger. 666.

^e *O. Onites*. Bocc. imus. 2. t. 38. Ger. 664.

^f *Origanum Majorana* *Lin.*

^g *Origanum heracleoticum* *Lin.*

^h *Origanum Dictamnus* *Lin.*

the whole plant has a piercing aromatic scent, and biting taste. This is the celebrated plant with which Venus cured the wound of Æneasⁱ. *Baum* has a dry, chaffy, angular calyx, flattish at top; the upper lip rising: the casque of the corol is a little arched, and deeply notched or bifid; the lower lip is trifid, with the middle lobe heart-shaped.

Common Garden Baum^k has the flowers growing in small loose bunches from the wings of the stalk, in whorls, and the pedicels are simple or unbranched. There are two plants of this genus growing wild, that have the name of *Calamint*^l. *Dracocephalum* is distinguished principally by the great inflation, or wide opening of the chaps of the corol; the upper lip also is arched, folded, and obtuse. Of this genus is the very fine smelling plant vulgarly called *Baum of Gilead*^m, which has compound leaves, consisting of three or five oblong, pointed, serrate lobes; and flowers coming out in thick, short spikes; the corols are pale blue. *Self-beal* is known immediately by its forked filaments, with the anthers inserted below the top: the stigma also is emarginate or bifid.

ⁱ Virgil Æneid. XII.

^k *Melissa officinalis* Lin.

^l *Melissa Calamintha* & *Nepeta* Lin. Blackw. t. 166, & 167.

^m *Dracocephalum canariense* Lin. Mor. hist. f. 11. t. 11, fig. last.

*Wild Self-heal*ⁿ, so common in pastures, has all the leaves of an oblong ovate form, serrate about the edge, and petiolate. *Scutellaria* is abundantly distinct from all the other genera of this order by its fructification; for the calyx is entire at the mouth, and after the flower is past, closes with a kind of lid; so that the whole bears a resemblance to a helmet, whence the names of *Cassida*, *Skull-cap*, and *Hooded Willow-herb*; and the seeds being hereby inclosed in a kind of capsule, this genus forms the connecting link between this order and the next. The species common on the banks of rivers, by ditch sides, and other watery places^o, has lance-shaped leaves, hollowed at the base, notched about the edge, and wrinkled on the surface; the flowers are blue, and proceed from the *axæ*, or angles formed by the leaves or subdivisions with the main stem.

The corols in all the genera of the first order, with very few exceptions, are open-mouthed, *Labiate*, or *Ringent*, properly so called. In the second order, which you are now going to survey, many of them are *Personate*, or *Labiate*, with the lips closed; some however have open bell-shaped, wheel-

ⁿ *Prunella vulgaris* *Lin.* Curtis, Lond. IV. 42. Ger. 632.

^o *Scutellaria galericulata* *Lin.* Curtis, Lond. III. 36. Ger. 477.

shaped,

shaped, or irregular corols. To have seeds inclosed in a *Pericarp* is common to all, and hence the name of the order *Angiospermia*. In most of the genera the calyxes are quinquefid; in some however they are bifid, in one trifid, in many quadrifid, and in two multifid.

Of those with bifid calyxes, you have the *Orobanche* or *Broom-rape*; which has an open corol, divided at top into four segments, and nearly regular; there is a gland at the base of the germ; and the capsule is unilocular and bivalvular. The common species^p has a pubescent stalk, absolutely undivided; the singular *feuillemort* hue of this plant is alone sufficient to betray it to you at first sight.

Among such as have quadrifid calyxes, are *Rhinanthus*, *Yellow Rattle* or *Cock's-comb*, and *Eyebright*: these have *Personate* corols: the first has the calyx swelling; and an obtuse, compressed bilocular capsule. The wild sort^q, common in moist meadows, is known by the shortness and compressed form of the upper lip of the corol; the colour is yellow; the calyx is very large, and, being an early flowering plant, this part grows dry before the time of mowing, and makes a crashing or rattling sound under the scythe. *Euphrasy* or *Eyebright*, once celebrated as fit " to

^p *Orobanche major* *Lin.* Curtis, Lond. IV. 44. Ger. 1311.

^q *Rhinanthus Crista-galli* *Lin.* Mor. hist. f. 11. t. 23. f. 1. Ger. 1071,

" purge

“purge the visual ray,” has the calyx cylindric; the anthers spinous at the base of one of their lobes; and the capsules of an oblong ovate form, and bilocular. The officinal species^r has ovato-linear leaves, sharply indented about the edges. It is an humble, neat plant, growing in dry pastures and heaths; and the corol, on a near view, is very elegant.

In the largest section, with quinquefid calyxes, you will find the *Antirrhinum* genus comprising forty-seven species. The corol is personate, prolonged at the base into a bag or spur; and the seed vessel is a bilocular capsule. Of two species formerly mentioned to you, *Toadflax*^s has linear leaves inclining to lanceolate, growing many together, upon an erect stalk; the flowers grow close in sessile spikes, terminating the stem; the under lip of the corol is hairy within; the chaps are orange-coloured, but the rest is of a pale yellow, and it ends in a long spur. It is now in flower, or will soon be so. Accident has produced a strange variation in this plant, by changing the corol from personate with four didynamous stamens, to regularly pentapetalous with five,

^r *Euphrasia officinalis* *Lin.* Mor. hist. t. 24. f. 1. Ger. 663.

^s *Antirrhinum Linaria* *Lin.* Curtis, Lond. I. 47. Ger. 550.

the rest of the plant remaining the same^t. Varieties partaking of the nature of two species are not uncommon^u, but as they are generally found among annual plants, and never produce seed, they are lost almost as soon as they come to perfection. Whereas this being perennial, and creeping much at the roots, has been preserved as an example of monsters in vegetable nature. *Snapdragon*^v has the leaves of the calyx rounded at top, the flowers growing in a spike, and the corols spurless; the colours of these are red with white or yellow mouths, or entirely white, or else white with yellow mouths: the leaves are lance-shaped and petiolate. Several species of *Antirrhinum* are wild on walls and in corn fields; and several others are not uncommon in gardens: as *Three-leaved Toadflax*^w, an annual plant, having ovate, smooth, gray leaves, generally ternate, as the name implies, but sometimes only in pairs: the flowers grow in short spikes at the top of the stalks, and are shaped like those of common Toadflax, only the tubes are not so long; they are yellow, with saffron-coloured chaps. Two or three perennial species, with hand-

^t This is described at length under the name of *Peloria* in the first volume of *Amœn. Acad.*

^u These are called *Hybridous* plants, or *Mules*.

^v *Antirrhinum majus* *Lin. Mill. fig. t. 42. Ger. 549.*

^w *Antirrhinum triphyllum* *Lin. Bocc. sic. t. 22.*

some spikes of blue flowers, and some of them smelling sweet^x, are usually in large borders, among flowering shrubs, and other perennials.

Scrophularia or *Figwort* is another of these; the corol is of the topsyturvy kind, almost globular in its form; the two upper divisions are the largest and erect; the two side-ones spread open, and the fifth below is reflexed. In many species, under the topmost division, in the chaps of the corol, there is a little flap resembling a lip: the flower is succeeded by a bilocular capsule. Two species are sufficiently common; one in woods and hedge-rows^y, with the angles of the stem blunted, and heart-shaped leaves, much prolonged at the tip, and marked with three rising nerves: the other by river sides, and in other watery places^z, with a membrane running along the stalk at the angles, and heart-shaped leaves blunted at the end. These plants have a dusky shade spread over their green, and their flowers are of a dull red.

Foxglove, one of the most showy of our wild plants, has an open corol, divided in-

^x *Antirrhinum purpureum*, repens & monspessulanum, &c. *Lin.* 1. Riv. mon. 82.—2. *Dill. elth.* 198. t. 163. f. 197.—3. *Dill. elth.* 199.

^y *Scrophularia nodosa* *Lin.* Blackw. t. 87. Mor. hist. f. 5. t. 8. f. 3. *Ger.* 716.

^z *Scrophularia aquatica* *Lin.* Fl. dan. 507. Blackw. t. 86. *Ger.* 715.

to four segments at top, and swelling out below, shaped like the fingers of a glove; the capsule ovate and two celled. *Wild or purple Foxglove*^a is distinguished by having the leaves of the calyx ovate and acute, with the segments of the corol obtuse, and the upper lip entire: the inside of the corol is beautifully sprinkled with spots resembling eyes; and the leaves are large and wrinkled: red is the colour of the flower in its wild state; when cultivated in gardens it varies to white and yellow.

Bignonia has a *cyathiform* calyx, narrow at bottom, and spreading wide at top; a bell-shaped corol, swelling out below, and divided into five segments at top; and a two-celled *siliqua* for a seed-vessel, containing winged seeds laying close over each other. The *Trumpet-flower*^b, with its trailing branches, that put out roots from the joints, to acquire support and nourishment from trees, in Virginia and Canada, its natural places of growth, has pinnate leaves, the lobes of which are cut: the large trumpet-shaped flowers are orange coloured. The *Catalpa*^c is a large tree with leaves remarkably simple, and heart-shaped: the flowers are produced in

^a *Digitalis purpurea* Lin. Curtis, Lond. I. 48. Fl. dan. t. 74. Ger. 790.

^b *Bignonia radicans* Lin. Mill. fig. pl. 65.

^c *Bignonia Catalpa* Lin. Duham. arb. I. t. 41. Catesb. car. I. t. 49.

great branching panicles; they are of a dirty white, with a few purple spots, and faint stripes of yellow; but, what is most remarkable, they have only two perfect stamens, with small rudiments of three others; the calyx also is not barely quinquefid, but divided quite to the bottom.

Acanthus, the leaves of which are said to have given the first hint of the elegant Corinthian capital, is also of this order, but of that section which has bifid calyxes: it has an irregular corol, without any upper lip; the lower one has three lobes; the anthers are villous, and the capsule is two-celled.

I cannot help remarking to you, since it has struck me, that the greater part of the genera in the principal section of this order, is dedicated to the memory of eminent botanists. Here stands the great Linnæus himself; the celebrated Arabian Avicenna; those fathers of the science Gesner, and Columna; of Italy, Crescentius, Tozzi, Vandelli, Durante; the illustrious Frenchmen, Bignon, Barrelier, Ruellius, Cornutus, Dodart; Celsius Toren, Brovall, Swedes; Buchner, Bontius, Volkamer, Loefel, Besler, Hebenstreit, Lindern, Gmelin, and other Germans; Oviedo, the Spaniard; and of England old venerable Gerard, Millington, and, in more modern times, Lord Petre and two contemporary professors of Oxford and Cambridge. The illustrious, the indefatigable Baron Haller, occupies a section alone,

alone, as he well merits, being himself an host. This plan, of consecrating newly discovered plants to perpetuate the memory of persons who have been eminent in the science, appears to me well imagined. Ladies have had this honour, as well as the men; and I have no doubt, dear cousin, but that you will one day merit a nich in this temple.

L E T T E R XXIII.

August the 4th, 1775.

BEFORE any idea of system or arrangement had gone abroad, every scientific eye perceiving a similitude between the Cabbage and Turnep, the Stock and Radish, in the fructification, there was an universal agreement among authors to place these plants, and others like them, in the same section or division of their books, and to treat of them all together. You have already seen^d the nature of this similitude, and have long been at no loss in classing the *Cruciform* tribe: you have only to learn that the fifteenth class (Tetradynamia) in the system of Linnæus, contains the same plants, as you have been accustomed to call *Cruciform*; and to recollect that it has this long name from four of the stamens being more powerful or longer than the remaining two; the circumstance on which Linnæus founds the character of the class; and which distinguishes it from the sixth, wherein the six stamens are of equal length, or at least not of that regular, proportional inequality that we discover in the class now before you.

^d In letter II.

It will suffice to examine a few of the genera, and species, which are not extremely numerous^c, and therefore my present letter will not extend to that frightful length that some of the former have done.

The *Siliculose* or short-podded order leads the way, and is subdivided into two sections; the first containing those which have the filicle entire, and the second such as have the filicle notched at top. From the first subdivision I shall select *Honesty* for your observation, because it is common in gardens, and has larger parts than most of these flowers. The filicle is oval, entire, quite flat, and stands on a pedicle; the valves are equal to the partition, parallel and flat: the leaflets of the calyx are bagged. The brilliant whiteness of these filicles has occasioned this plant to be called *White Sattin*; and from the shape of them it is named *Lunaria* and *Moonwort*. Linnæus mentions but two species; the *annual*^f differing from the *biennial*^g in having larger flowers of a lighter purple, and the pods longer and narrower: they have both heart-shaped leaves, indented on their edges, are a little hairy, and end in acute points; the lower ones are on long petioles, but the upper ones sit close to the stalk.

^c The genera are 32, and the species 287.

^f *Lunaria annua* *Lin.* Mill. illustr. Best. eyft. 7. f. 1.

^g *Lunaria rediviva* *Lin.* Best. eyft. 7. f. 2.

Of the second subdivision is the *Candy-tuft* or *Iberis*, known by an irregular corol, with the two outer petals larger than the two others. *Red Candy-tuft*^h is an annual herbaceous plant with red flowers growing in a kind of umbel; your gardener sows it in patches about the borders of your flower garden; it has lance-shaped leaves drawn to a point: the lower ferrate, the upper ones quite entire: the flowers of this are sometimes white, and then it is confounded with the bitter speciesⁱ, which however has the leaves not so sharp-pointed, and with only few indentations; the flowers also grow in a raceme, and the plant is more branched.

In this subdivision also ranges *Scurvy-grass* and *Horse-radish*, agreeing in a heart-shaped turgid, rugged filicle, the valves of which are gibbous and obtuse. *Officinal* or *Garden Scurvy-grass*^k has a branching stalk; the lower leaves roundish and hollowed next the petiole; the stem leaves oblong and sub-sinuuous: the white flowers are produced in clusters at the ends of the branches. *English Sea Scurvy-grass*^l has longer leaves, and all of them sinuate. *Horse-radish*^m, which few

^h *Iberis umbellata* *Lin.* Riv. tetr. 225.

ⁱ *Iberis amara* *Lin.* Riv. tetr. 112. Ger. 263.

^k *Cochlearia officinalis* *Lin.* Fl. dan. 135. Ger. 401.

^l *Cochlearia anglica* *Lin.* Fl. dan. 329. Ger. 401.

^m *Cochlearia Armoracia* *Lin.* Mor. hist. f. 3. t. 7. f. 2. Ger. 241.

besides

besides botanists observe in flower, has the radical leaves lance-shaped, and notched about the edges, the stem-leaves gashed.

The second order, containing the *Cruciform* flowers, succeeded by a *silique* or long pod, is also subdivided into two sections; in the first of which the leaflets converge at top, in the second they gape. *Radish*, *Erysimum*, *Stock*, *Wall-flower*, *Rocket*, *Arabis*, *Cabbage*, *Turnep*, &c. range in the first section: *Woad*, *Sea Colewort*, *Cardamine*, *Mustard*, *Charlock*, *Water-Cress*, &c. in the second. *Radish* has a cylindric, jointed, torose or swelling silique; and one pair of glands between the shorter stamens and the pistil, with a second pair between the longer stamens and the calyx. *Erysimum* has a columnar silique, with four equal sides. Of this there are several wild species: as first, the *common*ⁿ, growing by road sides, well distinguished by its runcinate leaves, and siliques pressed close to the stalk: secondly, *Winter-cress*^o with lyrate leaves, the outmost lobe roundish; and spikes of yellow flowers, growing by ditch sides: and thirdly, the garlick-smelling, called thence *Sauce-alone*, and from the usual place of its growth, *Jack-by-the-hedge*^p, has heart-

ⁿ *Erysimum officinale* *Lin.* Fl. dan. 560. Ger. 254.

^o *Erysimum Barbarea* *Lin.* Mor. hist. t. 5. f. 11, 12. Ger.

243.
^p *Erysimum Alliaria* *Lin.* Curtis, Lond. II. 48. Ger.

794.
Y 2 shaped

shaped leaves: the flowers are white, but the smell betrays it at once.

Stock and *Wall-flower* have two leaflets of the calyx gibbous at the base; the germ has a glandular toothlet on each side; and the seeds are flat. The two species are thus distinguished. *Wall-flower*^a has acute, smooth leaves, with angular branches. *Stock*^r has obtuse hoary leaves, with flattened siliques truncate at top: both have shrubby stems, and lance-shaped entire leaves. The *Annual* or *Ten-week Stock*^s differs in having an herbaceous stalk, the leaves somewhat toothed, the petals notched, and the siliques cylindric and acute at the end. *Rocket*^t has the petals obliquely bent; a gland on each side within the shorter stamens; the stigma forked, with the parts converging at top; and the silique stiff and upright.

Arabis has four glands, within the leaflets of the calyx, like reflected scales. Some of the species are wild^u and the *Alpine* sort^v is now common in many gardens:

^a *Cheiranthus Cheiri* *Lin.* Mor. f. 3. t. 8. f. 15. Ger. 456.

^r *Cheiranthus incanus* *Lin.* Mill. illustr.

^s *Cheiranthus annuus* *Lin.*

^t *Hesperis* *Lin.*

^u *Arabis thaliana*, Curtis, Lond. II. 49. stricta, *Turrita* *Lin.* Jacq. austr. t. 11. but the last has glands as in *Brassica*.

^v *Arabis alpina* *Lin.* Fl. dan. 62.

the leaves of this embrace the stalk, and are toothed about the edges; it bears white flowers in loose *corymbs*. *Cabbage*^w, *Turnep*^x, *Coleseed*^y, &c. all agree in having the glands disposed as in the Radish; the leaflets of the calyx are erect; the tails of the corols hardly so long as the calyx; the filique is roundish, a little flattened on each side, with the valves shorter than the partition; and filled with several globose seeds.

Of the second section, *Woad* has a lance-shaped, bivalve, one-celled filique, containing one seed only, and deciduous; the valves are boat-shaped. The species cultivated for dying^z, has the radical leaves notched and petiolate; the stem-leaves sagittate or shaped like the head of an arrow, and embracing the stalk; and oblong filicles. It is a large plant, with corymbs of small yellow flowers. *Sea Colewort* has a globose filique, or rather dry berry, which is deciduous, and contains one seed; but its most remarkable character is, that the four long filaments are forked at the end, and the anthers are born on the outer forks. Our species^a has the stalk and leaves smooth.

^w *Brassica oleracea* Lin.

^x *Brassica Rapa* Lin.

^y *Br. Napus* Lin.

^z *Isatis tinctoria* Lin. Blackw. 246. Mor. hist. f. 3. t. 15. f. 10, 11. Ger. 491.

^a *Crambe maritima* Lin. Fl. dan. 316. Ger. 315.

Cardamine, *Cuckow-flower* or *Lady's Smock*, (forgive the vulgar name) has the calyx gaping a little; two glands, one on each side between the shorter stamens, and the calyx; and an elastic silique, the valves rolling back with force when the seeds are mature, and thus throwing them off to some distance. There are many species wild, but that which is common in moist meadows, and on the banks of brooks^b, has pinnate leaves, the folioles on the radical leaves roundish, on the stem-leaves lance-shaped. The allusions to the whiteness of the corols will not always hold, since in some countries they are purple.

Mustard has the tails of the corols straight, and the glands as in the *Cabbage* genus, to which it is very nearly allied; differing from it only in the circumstance first mentioned, and in having the leaflets of the calyx spreading: the silique indeed is different; being torose and rough, with the partition usually very long; but this is reserved for the specific distinction. The wild species, a weed so common among corn, and generally called *Charlock*^c, has many-angled, torose, smooth siliques, longer than the

^b *Cardamine pratensis* *Lin.* Curtis, Lond. III. 40. Ger. 259.

^c *Sinapis arvensis* *Lin.* Fl. dan. 753. Mor. hist. f. 3. t. 3. f. 7. Ger. 233.

two-edged beak. *Black* or *common Mustard*^d has smooth filiques pressed to the raceme, or common bunch of the fructification. *White Mustard*^e has the filiques hispid, terminated by a very long, oblique, sword-shaped beak. If you suffer some of the plants which your gardener sows for small sallad to grow up and flower, you will find it to be the last named species. Common Mustard is a much larger plant, growing four or five feet high; the lower leaves large and rough, like those of the Turnep. Charlock does not grow more than two feet in height; the leaves, which are also rough, are sometimes jagged, and sometimes entire.

Water-Cress is of a numerous genus, there being twenty-nine species of *Sisymbrium*. The corol is spreading as well as the calyx in this genus; and the filique gapes with straightish valves. The specific characters of *Water-Cress*^f are, short, declining filiques, and pinnate leaves, with the lobes a little heart-shaped. The flowers are white, and grow in a corymb^g. There is another species, called *Flixweed*^h, not uncommon on dunghills, where rubbish is thrown out, by way sides, and in uncultivated places; this has decompound pinnate

^d *Sinapis nigra* Lin. Blackw. t. 446. Mor. t. 3. f. 1. Ger. 244.

^e *Sinapis alba* Lin. Blackw. 29. Ger. 244.

^f *Sisymbrium Nasturtium* Lin. Fl. dan. 690. Ger. 257.

^g See more in letter XVII.

^h *Sisymbrium Sophia* Lin. Fl. dan. 528. Ger. 1068.

leaves, and very small corols, the petals being less than the calyx: the filique is very long and slender, filled with small, roundish seeds: the leaves are as finely cut as Roman Wormwood; and the small yellow flowers are produced on loose corymbs, at the top of the stalks.

The season, dear cousin, is now in its wane, and a journey I must make on affairs of business, obliges me to leave the completion of my plan to another summer. If leisure and health are then granted me, I shall with pleasure resume the employment which you honour with your attention. In the mean time you and your fair daughter have enough to amuse you for the autumn, and even till winter confines you to the arrangement of your summer's labours within.

LETTER XXIV.

June the 1st, 1776.

SOME necessary occupations, dear cousin, have prevented me from resuming my pleasing task so soon as I had wished. But the spring has not been unprofitably employed by you, in the examination of such plants as were past flowering, before you received my former letters. You have done well by marking in your pocket-book, the names of all those which have either wholly escaped your search, or have presented themselves to you in a state unfit for complete examination. You are not so unreasonable as to expect that all nature should be open to your view at once. On the contrary, I am charmed with your patience and assiduity, in awaiting the proper seasons of flowering and fruiting; marking the times which authors have set down; and repeating your examinations in order to view plants in their different states, when they sometimes put on appearances so different, that to a less informed eye they might seem to be distinct species.

We are now arrived at a class, of which you have had no previous information in the introductory letters, designed to give you a general knowledge of the most natural. The
class

class *Monadelphia* however is a natural, as well as a most beautiful one. The union of the filaments at bottom into one body, or brotherhood as it were, is the leading character, and the occasion of the name. You will recollect that hitherto the stamens have been ever free and distinct from each other, how many soever you may have found in a single flower; you will also recollect having been informed, that in the sixteenth and succeeding classes, they are united, either at top or bottom, into one body or more. In this, as I observed before, the filaments all join below, next the receptacle, some higher than others; all of them, together with the anthers, being still entirely separate at top.

If then you have met with a plant which has five, ten, or especially many stamens, and you have not been able to assign it a place in the fifth, tenth, or thirteenth classes, examine it a little more attentively, and consider whether it has not a peculiar port or structure, announcing it to be a natural tribe. It may perhaps have a permanent calyx; but if it is also double you may be almost certain that it ranges here. The corol of your flower may perhaps have five heart-shaped petals, the side of one embracing or at least touching that which is next to it, in a direction contrary to the sun's apparent motion. The filaments perhaps,
connected

connected at bottom only, whether slightly, or for a considerable portion of their lengths, are gradually shorter as they recede from the middle; and the anthers are incumbent, or lie along over the top of them. You find the receptacle of the fructification prominent in the centre of the flower; the top of this receptacle surrounded by erect germs forming a jointed ring: all the styles united below into one body with the receptacle; but distinguished at top into as many filaments as there are germs: these germs becoming a capsule consisting of as many cells as there are pistils in the flower: and frequently consisting of as many connected *Arils*. In each of these cells lurks a kidney-shaped seed.

If you have not already divined this riddle, take the flower of a wild Mallow, an *Althæa*, *Lavatera*, or other plant resembling these; examine it by the characters just laid down, and you will have a perfect idea of the class *Monadelphica*. From the circumstance of the receptacle standing up in the middle of the flower, like a column, these have also the name of *columniferous* plants.

The orders are five, taken from the number of the stamens, which you remember determined the class in the first thirteen classes; but being now no longer used for that purpose, may serve very well for the other.

The

The fruit was formerly taken for discriminating the genera. This being found insufficient, succeeding nomenclators had recourse to the leaves; but Linnæus has, for this purpose, wisely adopted the calyx, which is always present, and is remarkable for its structure in this class. The illustrious Swede has ever shown great sagacity in seizing that part of the plant which is most constant, and furnishes the greatest choice of permanent variations, whereon to found the essential characters of his genera and speciesⁱ.

Not having taken the pistil for the distinction of the orders, that part remains to assist us in characterising the genera. Accordingly in the first order of this class, in which the flowers have five stamens, two genera have one, and two have five styles: the number of cells in the capsules serves to complete the generic character. Thus *Hermannia* has five styles, and a five-celled capsule: to which we may add that the five petals of the corol are rolled spirally in a direction contrary to the sun's apparent motion; and that their tails have a little membrane on each side uniting to form a cowled tube. Though there are many species of this genus, yet perhaps none of them may offer themselves to your view. We will proceed therefore to a favourite genus, that ranges in the second order, or that which has ten stamens:

ⁱ Genera 35, and species 256, in this class.

I mean

I mean *Geranium*, which, out of its eighty-two species, will furnish you ample matter for examination, especially as I know you cultivate so many of them. Before you determine the circumstances in which they differ, let us see in what they all agree; this is in having one style terminated by five stigmas; and a fruit composed of five grains, and beaked; whence its names of *Geranium* and *Crancsbill*. We may add that the calyx is single and five-leaved, as well as the corol; that the filaments are alternately longer and shorter, but all shorter than the corol; and very slightly connected in those which have a regular corol; that the style is longer than the stamens, and permanent; and that each of the five seeds is terminated by a tail or awn, assisting to form the beak, and which when the seed is ripe becomes spiral, and thus detaches the seed from the plant.

The African species, of which we have so many from the Cape of Good Hope, have the five parts of the calyx united at bottom; the petals unequal; and seven only of the filaments furnished with anthers; the flowers grow many together in a kind of umbel; the seeds are naked, with a feathered awn; and the leaves grow alternate upon the stalk, which is shrubby.

In this third section you find, among many others, the *Fulgid*^k, with a fleshy stem,

^k *Geranium fulgidum* Lin. Dill. elth. t. 130. f. 137.

putting

putting out but few branches; the leaves three-parted and gashed, the middle segment much larger than the others; frequently falling off, so as to give the stalks an appearance of being dead during the summer; the flowers are produced on short footstalks, in a sort of double umbel, each sustaining but two or three flowers, remarkable for their deep shining scarlet colour.

The well known *Scarlet*^a, which would be at least as much esteemed as the Fulgid, were it not more common. The leaves are almost orbicular, except that they are hollowed next the petiole; they are notched about the edge, but not gashed or lobate; their surface is downy; and they stain the fingers if handled roughly, whence the trivial name of *inquinans* or staining. This is a much loftier plant than the last, growing as high as eight or ten feet; and sends out abundance of erect branches: the flowers in the umbels are numerous, and are produced on very long peduncles.

The *Papilionaceous*^b, so called, because the corols have something the appearance of butterfly or pea-blossom flowers, the two upper petals, which are large, turning up like

^a *Geranium inquinans* *Lin.* Mill. illustr. Dill. elth. t. 125. f. 151, 151. Mart. cent. 3.

^b *Geranium papilionaceum* *Lin.* Dill. elth. t. 128. f. 155. Mart. cent. 15.

the banner or standard in those flowers; these are finely variegated, but the three under petals being reflexed and small are scarcely observed, but on a near inspection; the flowers are many in each umbel: the leaves are large, angular, rough, and stand on long petioles.

The *Hollow-leaved*^c has roundish leaves contracted on the sides so as to stand hollow; the edges are sharply indented; the flowers are large, and produced in large loose umbels; the corols are purple: it is a plant of large stature, and very hairy.

There is another sort, or variety, very like this; but it has leaves of a thicker substance, and divided into several acute angles: the branches are not so irregular, and the bunches of flowers are not so large.

The *Horse-shoe*^o is perhaps the species most commonly known of all the Africans; the dark or purplish mark, in shape of a horse-shoe upon the leaves, shows this Geranium to the eye at first sight; but it is not absolutely permanent; for we have varieties without it; we must have recourse therefore to the form of the leaves, as a more certain distinction: they are orbicular, hollowed next the petiole, divided on the circumference into several obtuse segments, each of which is slightly indented.

ⁿ Geranium cucullatum *Lin.* — cowled. Dill. elth. t. 129. f. 156. Mart. cent. 28.

^o Geranium zonale *Lin.* Comm. præl. 51. t. 1.

This

This sort is very branching: the flowers are produced in large, close umbels, on long peduncles, and vary from a light purple to a high scarlet.

The *Vine-leaved*^p has ovate, ascending pubescent leaves, having the smell of Baum, when rubbed; the flowers grow in a close head, on long peduncles, rising much higher than the branches; they are small, and pale blue.

The *Rose-scented*^q has also lobate leaves, waved and villous; like the last, the flowers grow in close heads; they are of a purplish blue: the branches are very irregular and weak: and the whole is weaker and grows taller than the former: the leaves when rubbed, smell like dried roses.

The plants of the second section have many things in common with those of the first; but differ in being herbaceous, and having the leaves opposite. Of these the *Odorous*^r is remarkable for its powerful scent, something like Aniseed: this has a very short fleshy stem, with long branches, and heart-shaped leaves extremely short: the flowers are produced from the side of long prostrate stalks, upon slender peduncles, three, four, or five together; they are white, and very small.

^p *Geranium vitifolium* Lin. Dill. elth. t. 126. f. 153.

^q *Geranium capitatum* Lin. Riv. pent. 326.

^r *Geranium odoratissimum* Lin. Dill. elth. t. 131. f. 138.

The *Night-scented*^s has sessile calyxes, and bifid one-leaved scapes: the leaves are hairy, and almost as finely divided as the carrot; the stalks are about a foot high, and have two or three smaller leaves that are sessile; hence arise two or three naked peduncles, terminated by an umbel of yellowish flowers, marked with dark purple spots, smelling very sweet after sun-set. Linnaeus has taken his trivial name from the dulness of the colour in the flower.

The third section contains such *Geraniums* as have only five of the stamens anther-bearing; five-leaved calyxes, and fruits hanging down. The corols of these are less irregular; and the seeds are naked, terminated by a hairy awn.

Of this section we have some European species, as *Hemlock Cranesbill*^t common in sandy soils: this has a branching stalk, pinnate leaves, with the pinnæ gashed and obtuse, and many flowers on a peduncle. Very like this is *Musk Cranesbill*^u, but it is a larger plant, much less common, and easily known by its musky odour. The divisions of the leaves are pinnatifid, Some species^v of this section are remarkable for the largeness of

^s *Geranium triste* *Lin.* *Corn. can. t.* 110. *Breyn. cent. t.* 58.

^t *Geranium cicutarium* *Lin.* *Curtis, Lond. I.* 51. *Ger.* 945.

^u *Geranium moschatum* *Lin.* *Riv. pent.* 110. *Ger.* 941.

^v *Geranium arduinum, gruinum, ciconium* *Lin.*

their beaks, and furnish a good idea of the name of the genus.

In the three remaining sections, all the ten filaments are topped with anthers; the calyxes are five-leaved; the corols regular; the seeds covered with an *aril*, and terminated by a smooth awn. In the fourth section, the flowers are conjugate; that is, there are two always on every peduncle: the plants are perennial.

Some of the largest and handsomest of the European sorts range in this section; as *Spotted Cranebill*^w, with the peduncles and leaves alternate, the calyxes a little awned, the petals waved, and the stem erect. The leaves are divided into five or six lobes, laciniate on their edges; those near the root sit on long petioles, but on the upper part of the stalk they are sessile. The flowers are of a dark purple. There is a variety of this with light purple corols.

Meadow Cranebill^x has the leaves divided into six or seven lobes, cut into several acute segments; they are wrinkled, and rather peltate; the petals are entire, and of a fine blue.

The *Geraniums* of the fifth section differ from those of the fourth only in being annual. Most of the common European sorts

^w *Geranium phæum* *Lin.* *Ger.* 945.

^x *Geranium pratense*. *Curtis*, *Lond.* IV. 49. *Ger.* 942.

are of this division: as *Herb Robert*^y known by its hairy, pointed, ten-angled calyxes. The leaves are doubly pinnate, with the end lobes confluent; they are generally hairy, the stalks red, and the whole plant has a strong hircine smell. *Shining Cranesbill*^z has the calyxes pyramidal, angled, elevated and wrinkled; the leaves rounded and five-lobed; the whole plant is smooth and shining; the stalks are red.

The *common Dove's-foot* or *soft Cranesbill*^a has the peduncles and floral leaves alternate; the petals bifid or rather obcordate; the calyxes awnless, but ending in a short point; and the stem rather erect. The stipules are also bifid: the leaves are very soft, kidney-shaped, divided half way into five or seven parts, and each of these lobes trifid and blunt. This is very common, especially in sandy soils. Another^b, very like it in many respects, but more partially distributed, has entire petals, scarcely longer than the calyx; and the stem more prostrate. *Long-stalked Cranesbill*^c has peduncles longer than the leaves, which are

^y *Geranium Robertianum* *Lin.* Curtis, Lond. J. 52. Ger. 939.

^z *Geranium lucidum* *Lin.* Fl. dan. 218. Mor. t. 15. f. 6.

^a *Geranium molle* *Lin.* Curtis, Lond. II. 50. Ger. 938.

^b *Geranium rotundifolium* *Lin.* Blackw. 58. Vaill. par. t. 15. f. 1. Mor. t. 15. f. 2.

^c *Geranium Columbinum* *Lin.* Vaill. par. t. 15. f. 4. Mor. hist. f. 5. t. 15. f. 3.

divided into five multifid lobes acute at the end; the calyxes are awned, and the arils are smooth. The peduncle is very long, and the lobes of the leaves are doubly trifid. *Jagged Cranesbill*^a has the leaves divided into five parts, and each of those into three acute segments; the petals are of the length of the calyx, and notched, and the arils are villous: this has the leaves more and finer cut than any of the others.

Of the last section, with one-flowered peduncles, we have a handsome sort wild, but not common, with orbicular leaves, divided into five or seven parts, and each of those into three: the flowers stand on long hairy peduncles, the corols are large, and of a deep purple. Many more species are known to the curious; but I have only selected such as the fields, the garden, and your little conservatory are most likely to furnish you.

In this class we find a singular plant, which has naturally eleven stamens; a number which you did not find among the classes. Having the Monadelphic character, it here forms the order *Endecandria*, and stands alone. Being a plant little known, I insist no longer on it^f.

The last order *Polyandria* is much the most considerable in number of genera and species.

^a *Geranium dissectum* Lin. Vaill. par. t. 15. f. 2.

^e *Geranium sanguineum* Lin. Bloody Cranesbill. Ger.

You have here *Silk-Cotton*^g the *True Cotton*^h, so much used in our manufactures, the numerous genus of *Sida* or *Indian Mallow*, *Althæa* or *Marsh-Mallow*, *Alcea* or *Hollyhock*, *Mallow*, *Lavatera*, *Hibiscus*, &c. The two first, with *Sida* and *Hibiscus*, have one pistil only; the rest have many. *Sida* and *Bombax* have a single calyx, but all the others have it double. The exterior calyx in *Cotton* and *Lavatera* is trifid; in *Mallow* consists of three leaflets; in *Alcea* is sexfid; in *Hibiscus* octofid; in *Althæa* novemfid. *Lavatera*, *Mallow*, *Alcea* and *Althæa* agree in having many seeds in a ring round a column, each covered with its proper aril. The seed-vessel of *Hibiscus* is a capsule composed of united cells including many seeds.

The officinalⁱ species of *Marsh-Mallow* is known by its simple downy leaves, hoary to the sight, and very soft to the touch; they are angular, but not divided to the bottom, and therefore simple. The flowers are like those of the *Mallow*, but smaller and paler.

Of *Mallow* there are many species: that which is so very common^k, has an erect herbaceous stem; five or seven-lobed acute leaves,

^g *Bombax Lin.*

^h *Gossypium Lin.*

ⁱ *Althæa officinalis Lin. Fl. dan. 530. Mor. hist. f. 5. t. 19. f. 12. Ger. 933.*

^k *Malva sylvestris Lin. Curtis, Lond. II. 51. Ger. 930.*

with both petioles and peduncles hairy. *Dwarf Mallow*¹ has a prostrate stem; orbiculate leaves hollowed next the petiole, obscurely five-lobed; the fruit-bearing peduncles declining. This is every way a smaller plant. *Vervain Mallow*^m has an erect stem, rough with bunched expanded hairs, many-parted roughish leaves, the lobes of which are obtuse and indented; the flowers large, and light purple. Another wild species called *Musk Mallow*ⁿ, is very like this, but has the radical leaves kidney-form and gashed; the stem leaves five-parted, and the divisions finely cut into narrow segments: the flowers have a musky smell, and the stem has single erect hairs sitting on a prominent point. *Cape Mallow*^o has an arboresecent stem ten or twelve feet high, and the leaves five-lobed and hollowed at the base. The whole plant is hairy, and these hairs exude a viscid aromatic juice. The flowers are deep red, and smaller than those of the common Mallow. The trivial name informs us of its country, and consequently that it stands in need of protection from you.

The gigantic, the gaudy *Hollyhock* is of the genus *Alcea*: there are many varieties with

¹ *Malva rotundifolia* Lin. Curtis, Lond. III. 43. Ger. 930.

^m *Malva Alcea* Lin. Ger. 930.

ⁿ *Malva moschata* Lin. Curtis, Lond. IV. 50. Mor. hist. f. 5. t. 18. f. 4.

^o *Malva capensis* Lin. Dill. elth. t. 169. f. 206.

double

double flowers, and different colours, as white, red of all hues from pale carnation to almost black, and yellows of different shades; but there are only two species^p the first having roundish leaves, cut at the extremity only into angles; the second palmate, cut deeply into six or seven segments, like the fig-leaf. Of the first there is a dwarf variety with variegated flowers, much esteemed, and called *Chinese Hollyhock*.

The shrub vulgarly named *Althæa Frutex* is an Hibiscus; a very numerous genus, comprehending no less than thirty-six species, most of them inhabitants of either India, and not generally known here. The *Althæa Frutex*^q however is a native of Syria, and bears the rigour of our climate, though it is very late ere it produces its flowers. The specific characters are, an arboresecent or woody stem, and wedge-shaped leaves, divided at top into three lobes, and standing on short petioles. The flowers are bell-shaped, and of various colours—pale or bright purple with dark bottoms, white with purple bottoms, variegated with dark bottoms, and yellow with the same: these flowers being large, gay, and numerous, make a handsome appearance, and give the completest idea of the classical character.

^p *Alcea rosea* Mill. illustr.—& *ficifolia* Lin.

^q *Hibiscus syriacus* Lin. Cam. hort. t. 3, 4.

China Rose also, notwithstanding its name, is no Rose, but an *Hibiscus*^r, with a woody stem, and ovate, sharp-pointed leaves, serrate about the edges: the colour, size, and appearance of the flowers, when they are double, gave occasion to the name of Rose; they frequently appear on Chinese paintings and paper, and are certainly very ornamental. The *Musk plant*^s of the West Indies is another species of *Hibiscus*; its kidney-shaped seeds have a very strong smell of Musk. The bark of some species^t is formed of fibres strong^u enough for cordage. One of them is cultivated in the West Indies for its pods, which they put into their soups. But all this we have nothing to do with as botanists.

^r *Hibiscus Rosa Sinensis* *Lin.* Rheed. mal. 2. t. 17.

^s *Hibiscus Abelmofchus* *Lin.* Mer. Surin. t. 42.

^t *Hibiscus vitifolius* & *Sabdariffa* *Lin.*

^u *Hibiscus esculentus* *Lin.* Sloan. jam. 1. t. 133. f. 3.

L E T T E R XXV.

June the 4th, 1776.

AFTER a short excursion we are returned, dear cousin, among your old acquaintance; and you have only to apply to the term *Diadelphia*, which is the name of the seventeenth class in Linnæus's system, all the knowledge you first acquired from the letter on Papilionaceous flowers^v, and which you have since increased so much by your observation and experience. You have admired the singularly admirable and beautiful structure of these flowers, in which all the plants of this class agree: you will now not be displeased to accompany me in an enquiry into their generic and specific differences. The number of genera in this class is 57, of species 695. The orders are four, taken from the number of stamens, which in the first order is five, in the second six, in the third eight, and in the fourth ten. In the order *Pentandria* however there is only one genus; in the order *Hexandria* two; and in the order *Oëandria* three; so that you perceive the last (*Decandria*) absorbs the far greater part of the class; and what you have learnt of Papili-

^v Letter III.

onaceous

onaceous flowers belongs indeed principally to this order. Of the three first orders there are only two genera, which you will have an opportunity of observing; and we will begin if you please with them.

Fumitory has two filaments, each of them terminated by three anthers; it has the clafical character therefore, and muft be of the order *Hexandria*. This genus has, besides this, a two-leaved calyx, a ringent rather than a papilionaceous corol, the upper lip however answering to the banner, the lower lip to the keel, and the bifid chaps to the wings: the bafe of each lip is prominent, but the upper one the moft; and one filament is inclofed in each. *Common Fumitory*^w which you will readily meet with as a weed in your kitchen garden, is known by a weak, diffufe, branching ftem, multifid leaves dividing into three, and the lobes trifid: the flowers growing in a raceme, and each being fucceeded by a round or rather obcordate one-seeded pericarp.

Milkwort has eight filaments, each terminated with an anther; and all united at bottom: it appertains therefore to the order *Oftandria* of this clafs. The characters of the genus are, a five-leaved calyx, with two of the leaflets like the wings of the papilionaceous flower, and coloured: the banner

^w *Fumaria officinalis* Lin. Curçis, Lond. II. 52. Ger. 1083.

of the corol is cylindric; the legume is obcordate, or inverse-hearted, and two-celled. Many of the species have a beard, crest, or pencil-formed appendage to the keel; those which have none are called beardless: and hence a commodious subdivision of this large genus: the last are subdivided into shrubby and herbaceous; the herbaceous again into simple and branched. Of thirty-eight species we have one only wild, and that is common on dry pastures and heaths^x: it is of the crested division, and bears the flowers in a raceme; the stem is herbaceous, simple, and procumbent, and the leaves are linear. This is a lowly plant, with pretty flowers blue, red or white. There is a beautiful species^y in the green-house, from the Cape, with a shrubby stem; oblong, smooth leaves, blunt at the end; and handsome flowers, large, white on the outside, but bright purple within; the keel crested, and shaped like a half moon. *Senega*^z root, so famous among the American Indians as an antidote to the bite of the rattle-snake, is from a species of this genus.

The plants of the order we are now to examine are obvious, not only by their papilionaceous flowers, but by their compound

^x *Polygala vulgaris* *Lin.* Fl. dan. 516. Ger. 563. 2, 3, 4, & 564, 5.

^y *Polygala myrtifolia* *Lin.* Mill. illustr.

^z *Polygala Senega* *Lin.* Mill. Dict.

leaves,

leaves, which in the greater part are pinnate, winged, or feathered, but in others trifoliate^a. In some genera the pinnate leaves have the lobes in pairs only^b, but it is more common to have them terminate in an odd lobe^c. Many of this pulse tribe have stems too weak to sustain themselves, they fly therefore to some stronger plant or other prop for support, and they are furnished with the necessary means of helping themselves, either by twining their stalks about and embracing their friend^d, or else by throwing out slender threads, like the vine, called *claspers* or *tendrils*, by which they lay fast hold^e.

Most of these plants having fruits that are esculent either to us, quadrupeds or birds, produce flowers in great abundance, and close bunches; in some of the genera they grow in a kind of umbel^f, much like those of the second order of the fifth class. I men-

^a As in *Trifolium* or Trefoil, which has its name from this circumstance, *Lotus*, *Medicago*, *Erythrina*, *Genista* or Broom, *Cytisus*, *Ononis*, *Trigonella*, *Phaseolus* or Kidney Bean, *Dolichus* and *Clitoria*.

^b *Orobus*, *Pisum* or Pea, *Lathyrus* or Everlasting Pea, *Vicia* or Vetch, *Ervum* and *Arachis*.

^c *Biserrula*, *Altragalus*, *Phaca*, *Hedysarum*, *Glycyrriza* or Liquorice, *Indigofera* or Indigo, *Galega*, *Colutea*, *Amorpha* and *Piscidia*.

^d *Phaseolus*, *Dolichos*, *Clitoria*, *Glycine*.

^e *Pisum*, *Lathyrus*, *Vicia*, *Ervum*.

^f *Lotus*, *Coronilla*, *Ornithopus*, *Hippocrepis*, *Scorpiurus*.

tion these circumstances, not as classical characters, but as leading features that may give you a shrewd suspicion, rather than a certain assurance. When you find a plant endued with some of these subordinate characters, you, I am certain, will not determine it at once upon them: no, they will only lead you to a more strict examination. Pinnate or trifoliate leaves, weak twining or climbing stems, no not even papilionaceous flowers will satisfy your discerning eye, till you have seen the union of the filaments at bottom. If you can procure any species of *Sophora*^g, you will be convinced of this; for without such caution you would infallibly have been misled; this genus agreeing with the pulse tribe in every respect, except in having the ten filaments distinct.

The proper character of this class you know is to have the filaments in two distinct bodies; and the character of the order *Decandria* is to have nine filaments united at bottom into a membrane surrounding the germ, and a tenth single, filling up the opening which is left for the germ to disengage itself, when it has arrived at a state proper to pass into a pod or legume. I must advertise you however that this is not strictly true of all the

^g A genus of the class *Decandria* and the order *Mono-gynia*. *Anagyris*, *Cercis*, &c. have also the same appearance.

genera; there are no fewer than eighteen out of fifty, which have all the ten filaments connected, so that the germ cannot grow into a legume without tearing asunder the membrane formed of the filaments. You must not therefore be deterred from setting down a plant as of the Pulse tribe, and of the class *Diadelphia*, when you find the ten filaments united into *one*, inclosed within a papilionaceous flower, and furnished with the other marks of the class. Of those which answer regularly to the classical character, some have a pubescent stigma^h, and the rest are distinguished by their legumes, as we shall now see, that we are going to examine their distinctive marks more narrowly.

You will observe in this class some trees, and many shrubs with papilionaceous flowers, as *Common*ⁱ and *Spanish*^k *Broom*; both of a genus in which the ten filaments are all united, and form a membrane adhering close to the germ: the stigma grows along the upper side of the top of the style, and is villous; the calyx is continued downwards, and is marked beneath with five little notches at the tip. *Spanish Broom*, with some other

^h *Colutea*, *Phaseolus*, *Dolichos*, *Orobus*, *Pisum*, *Lathyrus*, *Vicia*.

ⁱ *Spartium scoparium* *Lin.* Fl. dan. 313. Blackw. 244. Ger. 1311.

^k *Spartium junceum* *Lin.*

species, has simple leaves, in the rest they are ternate, trefoil or three-lobed. In *Common Broom* however there is a mixture of both. In the first also the leaves are lance-shaped, and the rush-like branches are opposite, round, and produce the flowers from the top, in a loose spike. In the second the branches are angular, and the flowers come out singly for a considerable length towards the top. They are large, and of a bright yellow in both species. There is also a *Spanish Broom* with a white flower¹; which has leaves like the other, but the branches striated, and the flowers in short spikes or clusters on the sides of them; they are succeeded by large oval pods containing one seed, whence the trivial name. *Portugal Brooms* with trifoliate leaves and yellow flowers, differing little from ours: and a sort with prickly branches, thence called *Prickly Cytisus*^m.

We have some wild shrubs of an humbler growth, somewhat resembling these, but of another genus called *Genista*; the characters of which are a two-lipped calyx, the upper lip two-toothed, the lower three-toothed; the banner of the corol oblong and reflected downwards from the pistils and stamens; the pistil depressing the keel, and the stigma

¹ *Spartium monospermum* Lin.

^m *Spartium spinosum* Lin.

involute.

involute. *Dyer's weed*, called also *Wood-waxen* and *Base Broom*ⁿ, which grows in pastures and headlands, has smooth lance-shaped leaves, and erect, round, streaked branches. *Needle Furze* or *Petty Whin*^o, which you will find wild on heaths, has small lance-shaped leaves, slender branches armed with long, simple spines; the flower branches are short, have no spines, and have five or six flowers in a cluster at the end of them: the colour of the corol in both species is yellow; and you would at first suppose that the former was a *Spartium*, and the latter a *Furze*, or of the genus *Ulex*; which however differs from both in having a two-leaved calyx, with the legume so short as scarcely to emerge from it. We have only one species, than which nothing, as you know, is more common on all our heaths; it has the three different names of *Furze*, *Gorse* and *Whins*^p, in different parts of the kingdom.

Restharrows are a lowly kind of shrubs, or rather undershrubs, with purple flowers, growing on commons, barren pastures, and headlands of corn fields; they have the name from the strength and matting of the roots, which circumstance has induced the Dutch

ⁿ *Genista tinctoria* *Lin.* Fl. dan. 526. Ger. 1316.

^o *Genista anglica* *Lin.* Fl. dan. 619. Ger. 1320.

^p *Ulex europæus* *Lin.* Fl. dan. 608. Ger. 1319.

to sow them on their sea banks. The cylinder of filaments is quite entire at bottom, without any fissure, in this genus; the calyx is parted into five linear divisions; the banner of the corol is striated; and the legume, a section of which is a rhomb, is turgid and sessile. We have two sorts, one^a with prickly smooth branches, and the flowers in a raceme, but coming out singly: the other^r with villous leaves and branches, but without spines; the flowers in a raceme, but generally two together; both have ternate leaves, except that towards the top they are simple.

In *Anthyllis* the calyx is turgid and includes the legume, which is small and roundish, containing one or at most two seeds. The only species we have wild is herbaceous, is called *Ladies-Finger* or *Kidney-Vetch*, and is not uncommon in chalky pastures; it has unequally pinnate leaves; and a double head of yellow flowers, but this latter character is not constant. The leaves are pubescent, and consist of three or four pair of lobes; except two under the umbel, which are digitate. There are several flowering shrubs of this genus; as that which is generally called *Jupiter's beard* or *Silver bush*^t

^a *Ononis spinosa Hudsoni*. Common, smooth or prickly Restharrow. Blackw. t. 301. Ger. 1322.

^r *Ononis inermis Hudsoni*. Hairy Restharrow. Ger. 1322.

^s *Anthyllis Vulneraria Lin.* Rivin. t. 18. Ger. 1240.

^t *Anthyllis Barba Jovis Lin.*

from the splendid whiteness of the leaves, which is owing to a fine nap or down that covers them; they are equally pinnate: the flowers are produced at the extremity of the branches, in small heads, and are yellow.

Lupins, which are so well known in the flower garden, agree in a two-lipped calyx; in having five of the anthers round, and five oblong, and in the shell of the legume being coriaceous or leathery. The common *white*^u sort, which is cultivated as a pulse in most of the southern parts of Europe, has the flowers growing alternate, without appendages; the upper lip of the white corol is entire, the lower three-toothed: the seeds are orbiculate and flattened. There are three sorts with blue flowers: the *Perennial*^v, which is the only one that is not annual, with alternate, unappendaged flowers; the upper lip of the corol notched, the lower one entire. This is an American plant: the digitate leaves are composed of ten or eleven lobes, whereas those of the former have no more than seven or eight: the flowers grow in long loose spikes, and are pale blue. The *great blue*^w, with alternate appendaged flowers; the upper-lip two-parted, the lower three-toothed. This

^u *Lupinus albus* *Lin.* Riv. tetr.

^v *Lupinus perennis* *Lin.* Mill. fig. 170. 1.

^w *Lupinus hirsutus* *Lin.*

has a strong stem, covered with a soft brownish down; the leaves have nine, ten, or eleven hairy, spatulate lobes: the flowers are in whorls, forming a sort of spike; they are large, and of a beautiful blue: the pods are very large, and have three roundish compressed seeds, very rough and of a purplish brown. *Narrow-leaved or tall blue Lupin*^x, has the flowers alternate and appendaged or pedunculate; the upper lip of the corol two-parted, the lower three-toothed: the lobes of the leaves are linear. The *Varied*^y is not very different in appearance from this: the flowers grow in half whorls, and are appendaged; the upper lip is bifid, and the lower slightly three-toothed: the corols are light blue or purple. It is shorter than the last; the leaves have fewer lobes, and stand on shorter petioles. The *Hairy*^z has the flowers in whorls and appendaged, with the upper lip two-parted; like the Great Blue Lupin; which it much resembles in stature and appearance; but the corols are flesh-coloured with the middle of the banner red, the lower lip is entire; the plant is hairy all over, and the leaves are lance-shaped, and a little obtuse at the end. The *Yellow*^a

* *Lupinus angustifolius* *Lin.* Riv. tetr.

y *Lupinus varius* *Lin.*

z *Lupinus pilosus* *Lin.*

a *Lupinus luteus* *Lin.* Riv. tetr.

is esteemed for the sweetness of its flowers: they grow in whorls and on peduncles; the upper lip of the corol is two-parted, the lower three-toothed. Thus have you a history of the whole genus of *Lupin*; for these are all the species hitherto known: and as you may easily have them growing together, you may compare them at leisure, and ascertain all their agreements and differences: could we do this in every genus, how clearly might we distinguish the species! but remember that culture may produce fictitious characters, which mislead unwary botanists.

In all the genera hitherto examined, the filaments have made one body at bottom; in the rest, which I shall now offer to your consideration, nine only are united, and the tenth is free, according to the proper character of the class. We will begin with some genera, distinguished (as I mentioned before) by a pubescent stigma. *Phaseolus* or *Kidney Bean*, in having the keel with the stamens and style spirally twisted, possesses one obvious character, that discriminates it sufficiently from all its congeners. Some of the species have an outer calyx, consisting of two roundish leaflets, which may more properly be called *bractes*. *Lathyrus* or *Everlasting Pea* has a flat style, villous above, growing broader upwards: in this it differs from the *Pea*, which has a triangular style
keeled

keeled above : both genera have the two upper divisions of the calyx shorter than the other three, and, in other respects, are very nearly allied. Some species of *Lathyrus* have one flower only on a peduncle : of these we have two wild ones ; one with yellow flowers, supporting itself among the corn by leafless tendrils, and having broad stipules shaped like the head of an arrow : the other with crimson flowers, long narrow leaves difficult to be distinguished from the grass among which it grows, and small, subulate or awled stipules. The first is called *Yellow Vetchling*^b ; the second, *Crimson Grass Vetch*^c. *Sweet Scented Pea*^d, with some few others, has two flowers on every peduncle ; each tendril has a pair of oblong ovate leaves, and the legumes are rough. The banner of the corol is dark purple, the keel and wings light blue ; but there are varieties ; one all white, and another with a pink banner, wings of a pale blush, and a white keel ; this is called *Painted Lady Pea*. *Tangier Pea*^e, another of the *biflorous* section, has the two leaves alternate, lance-shaped and smooth ; the stipules moon-shaped. The flowers grow on short peduncles ; have a purple banner, with wings and keel of a bright red, and

^b *Lathyrus Aphaca* Lin. Mill. fig. pl. 43. Ger. 1250.

^c *Lathyrus Nissolia* Lin. Ger. 1249.

^d *Lathyrus odoratus* Lin. Comm. hort. 2. t. 80.

^e *Lathyrus tingitanus* Lin. Jacq. hort. t. 46.

are succeeded by long jointed pods. *Everlasting Pea*^f is of the last division, having many flowers produced on one peduncle: this has also conjugate leaves, that is, growing in pairs, furnished with a tendril or clasper; the form of the leaves is elliptic or oval; and the stems, which climb very high, have membranaceous wings on each side between the joints; the flowers are red. There is a variety of this in the gardens, with broader leaves, larger and deeper coloured flowers. There is another sort not very different from this^g, having sword-shaped leaves; and a third^h, growing in woods, bogs, and wet meadows, which has many-leaved tendrils, and lance-shaped stipules: the lobes are six; and there are from three to six flowers on each peduncle; the corol is blue, with the greatest part of the wings and keel white. One species of this sectionⁱ, with yellow flowers, two-leaved tendrils which are extremely simple, and lance-shaped leaves, is very common in pastures, hedges, and woods.

Vetch or *Tare* is sufficiently distinguished by having a stigma transversely bearded on

^f *Lathyrus latifolius* *Lin.* Mill. fig. pl. 160. Mill. illustr. Ger. 1229.

^g *Lathyrus sylvestris* *Lin.* Fl. dan. 325. Mor. hist. f. 2. t. 2. f. 4.

^h *Lathyrus palustris* *Lin.* Fl. dan. 399.

ⁱ *Lathyrus pratensis* *Lin.* Curtis, Lond. III. 44. Ger. 1231.

the under side. The species, which are eighteen in number, may be ranged under two divisions, the first comprehending such as have flowers in bunches on peduncles; the second, those which are axillary, or have the flowers sitting almost close to the stem, and coming out from the angle which the leaves form with it. Of the first division we have the *Tufted*^k and *Wood Vetch*^l wild: both having flowers in bunches many together, but in the first imbricate; in this also the lobes or component leaves are lance-shaped and pubescent, and the stipules entire: in the second, the lobes are oval, and the stipules slightly toothed. The cultivated, and several wild sorts, are of the second division. The first^m has erect, sessile legumes, mostly two together; the leaves are retuse, and the stipules blotched. Of the others, *Spring Vetch*ⁿ, which is very nearly related to the former, has however the legumes generally single; the lower lobes retuse, the upper ones narrow, and almost linear; the lobes are from four to ten; and the stipules are spotted, as in the former. *Bush Vetch*^o has about four erect legumes growing toge-

^k *Vicia Cracca* Lin. Fl. dan. 804. Mor. hist. f. 2. t. 4. f. 1.

^l *Vicia sylvatica* Lin. Fl. dan. 277.

^m *Vicia sativa* Lin. Fl. dan. 522. Mor. t. 4. f. 12. Ger. 1227.

ⁿ *Vicia lathyroides* Hudf. Fl. dan. 58. Ger. 1227.

^o *Vicia dumetorum* Lin. Riv. tetr. 50.

ther on short pedicles: the lobes of the leaves are ovate, and quite entire; the size of the lobes decreases towards the end of the leaf: it ramps in hedges. The *Bean*^p is placed by Linnæus in the Vetch genus; and very justly, since it agrees with them in the characters of the fructification, and differs only in having a stouter stalk that supports itself, and therefore is not furnished with tendrils. Its native place of growth is supposed to be not far from the Caspian Sea, on the borders of Persia. All the different sorts of Bean, are in reality but varieties from the same original stock: you understand me to speak of Beans properly so called, in exclusion of Kidney Beans and others, which are not merely specifically different, but also of another genus.

Of the same section, with pubescent stigmas, is a genus of well known shrubs called *Colutea*: distinguished by their quinquefid calyx; and inflated legume, opening from the base, by the upper suture; the English name of *Bladder-Sena* is taken from the latter character. *Common Bladder-Sena*^q has an arborescent stem, and inversely hearted leaves. It grows twelve or fourteen feet high; its winged leaves have four or five pair of grayish lobes; the flowers come out from the *axæ*, two or three together on slender

^p *Vicia Faba* Lin.

^q *Colutea arborescens* Lin.

peduncles;

peduncles; they are yellow with a dark-coloured mark on the banner. This grows wild in the southern countries of Europe. There is another, which comes from the East, and has flowers like this, only of a brighter yellow; differing in being a much lower shrub, and in having nine pair of small oval, entire lobes to each leaf. A third about the same height with the second, but with branches still more slender, comes from the same country: the leaves of this have five or six pair of small heart-shaped lobes; the flowers are smaller, and of a dark red, marked with yellow. It is a doubt whether these be specifically different from the first: there is however one from Æthiopia, with scarlet flowers, which is very distinct: for it is a low, weak shrub, with leaves composed of ten or twelve pair of oblong-ovate, hoary lobes: the flowers are long, owing to the length of the keel, for the banner is shorter than that, and the wings are minute. You will easily suppose from its country, that it cannot stand the cold of a severe winter with us; it does not shrink however from a mild one, in a dry soil and warm situation. There is also an herbaceous species^t, with smooth linear lobes to the leaves; but this is an annual plant of little beauty, and therefore rarely cultivated.

^r Figured in Comm. rar. t. 11. and Mill. fig. 100.

^s *Colutea frutescens* Lin. Mill. fig. pl. 99.

^t *Colutea herbacea* Lin. Comm. hort. 2. t. 44.

There

There are several other shrubs of the Pea-bloom tribe: as the different species of *Cytisus*, of wick *Laburnum*^u is one. This is known by yellow flowers hanging in large simple racemes, and three oblong-ovate lobes to the leaves. There is a variety with narrower leaves, and longer bunches of flowers, more common in shrubberies than the first, which is a larger tree and comes to excellent timber; but this making a better appearance when in flower, is preferred in ornamental plantations. *Sessile-leaved Cytisus*^v, vulgarly called *Cytisus secundus Clusii*, has the flowers in short, erect racemes, at the ends of the branches; each flower has a little triple bracte at the base of the calyx; the leaves on the flowering branches are sessile, but the others are petiolate. The flowers are of a bright yellow, and the pods are short, broad, and black. *Evergreen Cytisus*^w has the flowers coming out singly from the side of the stalk, with very hairy, trifid, obtuse, oblong, swelling calyxes: the stalks extremely hairy; the leaves also hairy, especially underneath. The flowers are pale yellow; and the pods long, narrow, and rough. All these, and the rest of the

^u *Cytisus Laburnum* Lin. Jacq. austr. 4. t. 306.

^v *Cytisus sessilifolius* Lin.

^w *Cytisus hirsutus* Lin.

species,

species, agree in a two-lipped calyx, the upper lip bifid, the lower three-toothed; and a legume attenuated at the base; and pedicled, with several seeds in it. The leaves are ternate.

Robinia has a quadrifid calyx; an expanding, reflex, roundish banner; and a gibbous, elongate legume, containing several seeds. The tree which you admire for its long racemes of sweet-smelling white flowers, hanging down like those of *Laburnum*, is of this genus: I mean the *Bastard Acacia*^x, called in North America, its native country, *Locust-tree*. The leaves are pinnate, consisting of eight or ten pair of oval lobes terminated by an odd one; all entire, and sitting close to the mid-rib: the stipules are armed with strong, crooked thorns: and the flowers come out singly, or only one on a pedicle in the racemes. The *Caragana*^y, a Siberian shrub, has leaves abruptly pinnate, that is, winged not terminated by an odd lobe, or composed of four or five pair of oval lobes only: this has no spines, and the yellow flowers come out singly from the *axæ*. There are several other trees and shrubs of this genus; but these are the most known.

Coronilla is another genus of shrubs, com-

^x *Robinia Pseudacacia* *Lin.* *Seba mus.* I. t. 15. f. 1.

^y *Robinia Caragana* *Lin.*

prehending however some herbaceous plants. They all agree in a two-lipped calyx; the upper lip two-toothed, the lower having three little teeth; the superior teeth conjoined; in a banner scarcely longer than the wings; and in a very long, straight legume, contracted between the seeds, and, instead of opening by the futures, falling off in joints.

— *Scorpion Sena*^z is a species of this genus very common among shrubs: it is immediately known, by having the tails of its yellow corols three times as long as the calyx; two or three flowers come out together upon long peduncles from the sides of the branches, which are slender, and angular: the leaves are pinnate, and composed of three pair of lobes terminated by an odd one: the legumes are long, slender, taper, and pendulous; the seeds cylindric. There are several beautiful shrubs of this genus, but too tender to bear the open air in our climate.

The plants from which indigo is made^a are of this class; and many of the kindred genera resemble them in quality as well as outward form and character. *Scorpion Sena* in particular, it is said, will yield a dye nearly equal to indigo, if the leaves are fermented in a vat in the same manner as is

^z *Coronilla Emerus* Lin. Mill. fig. 132.

^a *Indigofera* Lin. Mill. fig. 34.

practised with those plants; and you remember complaining perhaps, that the yellow flowers of the Lotus would turn blue in drying unless you took care to keep them separate from other plants, and to change them often.

Liquorice is also of the same class: it has a two-lipped calyx, with the upper lip divided into three parts, and the lower absolutely simple and undivided; the legume is ovate and compressed, with very few kidney-shaped seeds. The species which is cultivated for the sake of its roots^b has smooth legumes, no stipules, and pinnate leaves consisting of four or five pair of lobes, terminated by an odd one, which is petiolate. It is a lofty plant for an herbaceous one, the stalks being from four to five feet high: the flowers come out in erect spikes from the *alæ*, and are pale blue.

Hedysarum is a most numerous genus, containing no fewer than sixty-seven species, all however conspiring in having the keel transversely obtuse, and the legume jointed, with one seed in each joint. The genus is subdivided into four sections, from the leaves; which in the first are simple; in the second, conjugate; in the third, ternate; and in the fourth, pinnate. I shall present you only two species, and they of the last section.

^b *Glycyrrhiza glabra* Lin.

L E T T E R XXV.

One transplanted from Italy into the gardens; and the other from a wild state to a cultivated one. The first is the *French Honeyfuckle*^c which is distinguished from the rest by a diffused stalk, and by its jointed, prickly, naked, straight legumes; its pinnate leaves point it out to be of the fourth section; they have five or six pair of lobes, terminated by an odd one; and from their base comes out a long peduncle, sustaining spikes of beautiful red flowers. The other is the *Saintfoin*^d; the characters of which are an elongated stem; the wings of the corol equalling the calyx, and one-seeded prickly legumes: this has also, of course, pinnate leaves. It adorns the chalky hills with its beautiful spikes of red flowers; and contributes largely among many others of this class to feeding of cattle. For this the *Trefoils* are most justly celebrated; there are forty-six species of them, all having the flowers growing in a head; and the legume very short, scarcely emerging from the calyx, not opening, but falling off entire, and containing but one, or at most two seeds. Though this be a genus easily distinguished by its habit, yet the characters are by no means constant, and perhaps there is not one common to all the species. *White Trefoil*, com-

^c *Hedysarum coronarium* *Lin.*

^d *Hedysarum Onobrychis* *Lin.* Jacq. austr. t. 38. Rivin. t. 2. Ger. 1243.

monly

monly called *Dutch Clover*^e, has a creeping, perennial stem; the heads umbelled; and the legumes covered and four seeded. *Purple Trefoil*, *Honeysuckle Trefoil*, or *Red Clover*^f has the flowers growing in globular subvillous spikes, girt with opposite membranous stipules; and the corols all of one petal. There are many wild species of this genus; but the *Yellow Trefoil*, cultivated under this name, or that of *Nonefuck*, is of another genus, as we shall see presently.

Lotus has a tubular calyx; the wings of the corol clapping close together upwards longitudinally; and an upright cylindric legume. The wild species is called *common Bird's foot*^g, and is distinguished by its decumbent stems, many flowers growing together in depressed heads; and exactly cylindric, spreading legumes. The corols are of a bright yellow.

Lucerne^h is of the genus *Medicago*, the character of which is that the keel of the corol bends down from the banner, and that the legume is flattened, and spiral or wreathed like the shell of a snail. The specific character is this—the stem is erect and smooth; the flowers grow in a raceme, and the legumes are contorted: the colour of the

^e *Trifolium repens* *Lin.* Curtis, Lond. III. 46. Ger. 1185.

^f *Trifolium pratense* *Lin.* Blackw. t. 20. Ger. 1185.

^g *Lotus corniculatus* *Lin.* Curtis, Lond. II. 56.

^h *Medicago sativa* *Lin.* Mor. hist. f. 2. t. 16. f. 2.

corols is blue. The species cultivated under the name of *Trefoil* or *Noneſuch*^w has the ſtems procumbent; the flowers in oval ſpikes; and the legumes kidney-form, with one ſeed only in each; the corols are ſmall and yellow. In a cultivated ſtate the ſtems draw each other up, and loſe, in a great meaſure, their natural procumbency, as does alſo *Bird's-foot Trefoil*, when it has other plants about it, as in graſs-fields, &c. There is a ſpecies of *Medicago* called *polymorphous* or *many-form*¹, from the variety of appearances it puts on, or from the change of figure in the pod. We have one variety very common wild^m, called *Heart-Clover* from the form of the leaves, which are alſo generally ſpotted: each head conſiſts of four or five little yellow flowers; the legumes are globoſe, ſpiral, and covered with very diverging ſpines: and in the garden you have the vegetable *Snails*ⁿ, with large, ſpiral, globoſe legumes, naked, or not covered with ſpines; and the *Hedgebogs*^o, whoſe legumes are cloſely armed with long ſpines pointing every way. Theſe all have the

* *Medicago lupulina* *Lin.* Curtis, Lond. II. 57. Ger. 1186.

¹ *Medicago polymorpha* *Lin.*

▪ *Medicago polymorpha arabica* *Lin.* Curtis, Lond. III. 47. Ger. 1190.

° *Med. polym. ſcutellata* *Lin.* Mor. hiſt. f. 2. t. 15. f. 4.

• *Med. polym. intertexta*. Mor. f. 7, 8, 9.

stem diffuse; the stipules toothed, and the legumes spiral. This class has also its vegetable *Caterpillars*, but they are of another genus^p.

I fear you will think I have already made this letter too long. However, as it may be some time before you hear from me again; as the next class is a very small one, and completes the set of plants with united filaments, I will trespass on your patience whilst I go through it.

The Class *Polyadelphia*, then, comprehends all such flowers as have the filaments united at bottom into more than two parcels. The filaments are in bunches, or pencilled, as one might call it, since they are collected into bodies resembling a camel's hair pencil. If you were not to attend to this character, you might easily suppose these plants to belong to the class *Polyandria*, for they have no striking appearance, like the pulse tribe and some others, announcing them immediately to range under this class.

There are four orders, taken from the stamens; *Chocolate*^q is in the first, *Pentandria*; a genus called *Monsonia* in the second; *Citron* comprehending *Oranges* and *Lemons* in the third; and eight genera in the fourth. The whole number of species is only sixty-five.

^p Scorpiurus. Riv. tetr. 210.

^q Theobroma Cacao Lin. Sloan. jam. 2. t. 160. Merian. surin. t. 26. and 63. Catseb. car. 3. t. 6.

The beautiful, odoriferous, well known, and deservedly esteemed genus of *Citrus* has these characters—a small calyx five-toothed at top; a corol of five oblong petals; about twenty stamens, placed cylindrically about the germ, with the filaments connected rather slightly, sometimes into more, sometimes into fewer parcels; one pistil, and, for a fruit, a berry generally nine-celled, with a bladdery pulp, in which the seeds are lodged.

You will have pleasure in examining at leisure the three elegant species of this genus, and in regaling your senses, whilst your mind imbibes instruction. When they are in fruit, you distinguish them immediately; but when they are not, you will find that the *Citron*^r has the petioles linear or all of a size, like most other petioles; whereas the *Orange*, *Lemon*, and *Shaddock*, have the petioles winged in shape of a heart; so that the main leaf seems to grow out of a smaller one. Linnæus makes the *Orange* and *Lemon*^s to be of one species, and to be distinguished by pointed leaves from the *Shaddock*^t, which has them obtuse, and emarginate or notched at the end: not to mention the great size of the fruit, the flowers of this grow more in racemes, which are also

^r *Citrus Medica* Lin. Virg. georg. edit. Mart. p. 135.

^s *Citrus Aurantium* Lin. Mill. illustr. *citrus aurantium*

^t *Citrus decumana* Lin. Rumph. amb. 2. t. 24. f. 2.

a little nappy or woolly. I dare presume that you are by this time so great an adept in Botany as readily to admit, in spite of the information of your taste to the contrary, that the Seville and China Oranges may be varieties of the same species, owing all their difference to climate. Neither perhaps do you find much difficulty in persuading yourself, that the large and generous Lemon may not be specifically different from the little, round, sour Lime; notwithstanding some little difference in the leaves, and the spines on the branches of the latter. But I much doubt whether you will be able to persuade your fair daughter to admit that the austere, long, pale Lemon, is not a species totally distinct from the round, deep-coloured Orange, the flavour of whose juice she enjoys with so much delight. I will consent that she should enjoy her incredulity, at least if she can distinguish these trees when they are destitute of fruit. The position of the stamens informs you that this genus is of the order *Icosandria*.

The genus *Hypericum*, in the last order (*Polyandria*) of this class, has many more species than all the other genera put together. Several of them are wild, and several others are commonly cultivated among shrubs: they are not however all shrubs, for many species are herbaceous. All plants do not exhibit the classical mark, in this or any

other class, with equal evidence; in this genus the numerous stamens will easily separate from the receptacle in pencils or parcels, and thus evidently show what is their proper place in the system. Being thus certified that your plant does not belong to the class *Polyandria*, but to this; you will easily distinguish it from its congeners, by its five-parted calyx including the germ; by its corol of five petals; by the abundance of stamens, usually forming five squadrons; and by the seed-vessel being a capsule, divided into as many cells as there are styles to the flower: these are either one, two, three, or five in number; and hence a subordinate division of the genus into four sections: there is however only one species with one style, and there are only two species with two; the far greater number have three: and among these are all the European ones.

Common St. John's wort^u has two characters so remarkable that it cannot well be mistaken, as soon as they are understood: for it has an *ancipital* or two-edged stem, that is, roundish, or a little flattened, and running out longitudinally into two little edges or membranes opposite to each other: and its obtuse leaves are punctured all over their surface, so as to appear, when held up

^u *Hypericum perforatum* Lin. Curtis, Lond. I. 57. Ger. 539.

against the light, as if they had been pricked with a pin. Another wild sort not near so common, growing in moist hedges, and woods, and called *Saint Peter's wort*^v has square stalks; it is about the same size with the other, but does not branch so much: the leaves are shorter and broader, and have none of the pellucid dots which are so remarkable in the former. *Trailing Saint John's wort*^w is a pretty little plant, found on dry pastures and heaths: it has two-edged, prostrate, filiform stems; smooth leaves; and axillary, solitary flowers. *Upright Saint John's wort*^x is an elegant species, growing in woods and heaths; with columnar stems: stem-clasping, smooth, heart-shaped leaves; and serrated calyxes with the teeth glandular.

The two most common sorts, cultivated among other shrubs, are the *stinking shrubby*^y and *Canary*^z *St. John's worts*. They have both a rank smell, resembling that of a goat, which however, in some circumstances, and at certain distances, seems to be sweet, at least to some persons; both also have three pistils: but the first is a much lower

^v *Hypericum quadrangulum* Lin. Curtis, Lond. IV. 52. Ger. 542.

^w *Hypericum humifusum* Lin. Curtis, Lond. III. 50. Ger. 541.

^x *Hypericum pulchrum* Lin. Curtis, Lond. I. 56.

^y *Hypericum hircinum* Lin.

^z *Hypericum canariense* Lin. Comm. hort. 2. t. 68.

plant, and has the stamens longer than the corol; whereas in the second they are shorter. *Garden Tutsan*^a is evidently of this genus: it is one of those which have five pistils, the stems are low, simple, herbaceous, and quadrangular; the leaves smooth, and quite entire: the roots creep extremely, and the flowers are very large. *Wild Tutsan*, or *Tutsan Saint John's wort*^b, called also *Park-leaves*, has a shrubby two-edged stem; three pistils, and a berried fruit, or soft coloured pericarp: the flowers of this are small, and the stamens extend beyond the corols. It grows wild in woods, and sometimes in moist hedges. Of the more rare and tender sorts, the *Majorca Saint John's wort*^c is very distinguishable by the scars all over the slender red branches; the leaves also are *repand* or waved on their edges, have small protuberances on their under surface, and at the base embrace the stalk: the flowers are large, with the stamens a little shorter than the corol, and five pistils. Lastly, *Chinese Hypericum*^d, which stands alone, as having one pistil only, has a shrubby stem, coloured calyxes, stamens longer than the corol, and is one of the most beautiful

^a *Hypericum Ascyron* *Lin.* Gmel. fibir. 4. t. 69.

^b *Hypericum Androsæmum* *Lin.* Curtis, Lond. III. 48. Ger. 548.

^c *Hypericum balearicum* *Lin.* Mill. fig. pl. 54.

^d *Hypericum monogynum* *Lin.* Mill. fig. pl. 151. f. 2.

of this genus, so gay with its yellow corols, and abundant crop of stamens.

With this large harvest, I leave you, dear cousin, till I shall have found leisure to prepare the extensive and most difficult tribe of compound flowers, for your inspection.

L E T T E R XXVI.

August the 24th, 1776.

THOUGH this letter, dear cousin, will arrive late in the season, yet it will be in time for you to examine the far greater part of the class *Syngenesia*, or tribe of compound flowers, which blow chiefly in the autumn. You are well aware that the essential character of this class, is the union of the anthers. You are perfect mistress of the structure of a compound flower, and of the different florets that compose it^e. And lastly, the several orders into which the class is divided are familiar to you, and the foundation of them well understood^f. Very little therefore remains to premise, before we proceed to the examination of the genera and species.

This is by much the most numerous of the natural classes^g; and therefore it should, in all probability, be more difficult to find sufficient generic and specific distinctions here than in any other: such however

^e See letter VI.

^f See letter X.

^g The number of genera being 116, and of species 1247.

has

has been the sagacity and industry of Linnaeus, that I hope you will not find any great difficulty, even in the two first orders, which contain above two thirds of all the genera.

To facilitate the investigation, in the first order, *Polygamia Æqualis*, it is subdivided into three battalions, easily distinguished by the most obvious characters. The first contains the flowers composed wholly of ligulate florets, which are the Semiflosculous flowers of Tournefort: the second contains the *capitate* or headed flowers: and the third, the *discoïd* flowers. So that there are no radiate flowers in this order: the flowers of the first section are wholly made up of such florets as compose the ray of these: in the two other sections there are none of these ligulate corols or semiflorets, but the compound flower is wholly made up of tubulous corols, or florets properly so called: in the second section these are long, and the calyx bulges out at bottom, as in the thistles; in the third, the flowers resemble a Daisy or other radiate flower, with the ray pulled off.

The calyx, the receptacle, and the crown of the seed will in general be found sufficient to furnish the generic distinctions in this order^h.

Thus

^h The calyx is single, or simple in *Seriola*, *Geropogon*, *Andryala*, *Tragopogon*: calyced, or furnished with a second

Thus *Tragopogon* or *Goat's-beard* is known by its simple calyx, naked receptacle, and feathered stipitate down: and these three circumstances are sufficient to distinguish this genus from all others; provided you have first assured yourself, by the rules already laid down, that your flower is of the compound tribe, that each floscule has the anthers united into a cylinder, which the pistil, terminated by two revolute stigmas, perforates; and that the corols are all ligulate: for thus it is that you come at the class, order, and section. I cannot suppose that you have any difficulty in distinguishing a natural compound flower, from a double one, the creature of art and culture, though the similarity may mislead those who are not accustomed to observation; because I am certain that if you have the least doubt, you

a second set of leaflets at the base in *Cichoreum*, *Picris*, *Crepis*, *Chondrilla*, *Prenanthes*, *Lapsana*, *Hyoseris*; in the rest imbricate. The receptacle is villous in *Scolymus*, *Cichoreum*, *Catananche*, *Seriola*, *Hypochaeris*, *Geropogon*; in the rest it is naked, that is, has neither hairs nor chaffs between the floscules. *Scolymus*, and *Lapsana* have no pappus or down: in *Seriola*, *Andryala*, *Crepis*, *Prenanthes*, *Lactuca*, *Hieracium*, *Sonchus*, the down is simple; in *Hypochaeris*, *Geropogon*, *Tragopogon*, *Picris*, *Leontodon*, *Scorzonera*, *Chondrilla*, it is feathered; in *Cichoreum* the crown of the seed is five-toothed, in *Catananche* five-awned, in *Hyoseris* crowned with a calycle. In some genera this down sits close to the seed, in others it is *stiped* or *stipitate*: that is, has a stem interposed between it and the seed.

will

will pull out a floscule, in order to see whether it has a seed, stamens, and pistil, or is only a mere flat petal. But to return to our plant.—*Yellow* or *Common Goat's-beard*ⁱ, which grows wild among the grass in meadows, is distinguished by entire upright leaves, and by the segments of the calyx at least equalling in length the outer floscules. Towards noon you will not easily find this plant, because the flowers are then always closed: after the flower is past, *Goat's-beard* is very apparent, on account of the large globe formed by the down of the seeds, till the wind has at length torn them from the receptacle, and wafted them separately to distant places.

Salsafy^k, which your gardener will furnish you with from the kitchen garden, has the segments of the calyx much longer than the floscules, and the peduncles swell out remarkably under the flower; which is large, and of a fine blue.

Another plant of this tribe which you may also have from the kitchen garden, is the *Scorzonera*, of a genus nearly allied to the last; agreeing with it in having a naked receptacle and a feathered stipitate down, but differing from it by an imbricate calyx, with the scales *scariose*, or black as if parch-

ⁱ *Tragopogon pratense* *Lin.* Mor. hist. f. 7. t. 9. f. 1. Ger. 735.

^k *Tragopogon porrifolium* *Lin.* Mor. t. 9. f. 5. Ger. 735. Fl. dan. 797.

ed on the edge. The cultivated species¹ has a branching stem, and entire, stem-clasping leaves, slightly sawed on their edges: the flowers are of a bright yellow.

Sowthistle and *Lettuce* agree in a naked receptacle, an imbricate calyx, and a simple down to the seed. But in the first the calyx is gibbous, or swelling at the base; in the second it is cylindric, with membranous edges: the first has a sessile down; in the second it is stipitate, and the seeds are polished. You will always find it useful, where you can, thus to bring together and compare plants of nearly allied genera, in order to consider well their similitudes and differences, and to give you a readiness in making those minute but important distinctions, so necessary to discrimination in natural tribes, wherein all seems alike to the untutored eye, as the sheep of the flock to the ordinary passenger; whereas the shepherd knows each by its proper marks, and calls them all by their names.

Of the *Sowthistle*^m, that vulgar weed of the kitchen garden, there are many varieties; the rough and the smooth; with lacerate leaves and simple ones, &c. which I mention, only that you may not be led to search for them, as distinct species; in rea-

¹ *Scorzonera hispanica* Lin.

^m *Sonchus oleraceus* Lin. Curtis, Lond. II. 58. Ger.

lity these differences are owing merely to accident and situation.

Hieracium or *Hawkweed* is a numerous genus of this order and section; the calyx is ovate and imbricate, the receptacle naked, and the down simple and sessile. There are many species wild in this country; oneⁿ, which is a large plant, on walls and banks and in woods; with a branching stem, the radical leaves oval and toothed, and a smaller leaf on the stalk: and another, very common indeed in dry pastures, called *Mouse-ear Hawkweed*^o, from the long hairs upon the leaves, which are ovate, and absolutely entire; this sort throws out runners, and the flowers come out singly on naked stalks. There are other species, vulgarly called *Hawkweeds*, which range under other genera, as the *Crepis*, which differs from *Hieracium*, in having the calyx only calyceled, with deciduous scales.

I shall conclude the first section with *Succory* or *Endive*; which has the calyx calyceled, a few chaffs between the floscules on the receptacle, and the crown of the seed mostly five-toothed and obscurely hairy. *Wild Succory*^p has runcinate leaves, and generally

ⁿ *Hieracium murorum* *Lin.* *Mor. hist.* f. 7. t. 5. f. 54. *Ger.* 304.

^o *Hieracium Pilosella* *Lin.* *Curtis, Lond.* IV. 54. *Ger.* 638.

^p *Cichoreum Intybus* *Lin.* *Curtis, Lond.* IV. 56. *Ger.* 284.

two sessile flowers coming out together: *Endive*^q has solitary, peduncled flowers, and entire leaves, only notched about the edge. Both have flowers of a fine blue; but the first is perennial, and the second only biennial. Curled Endive, though differing so remarkably from its parent in the leaves, is but a variety of the last.

The greater part of the second section, in this first order of the nineteenth class, is occupied by the Thistles, a most untractable genus, not at all adapted to the delicate fingers of our lovely *Flora*. The calyx is all imbricate with thorny scales; and how will she tear this asunder, to discover that the receptacle has hairs between the seeds: yet these two circumstances form the character of the genus; and she must observe that there are some plants commonly called *Thistles*, which are not of the genus *Carduus*. For instance, the *Common Way-Thistle*^r not having spines to the scales of the calyx, which also is cylindric in shape, whereas in the *Cardui* it bulges out at bottom, and the receptacle being naked, is not a *Carduus* in Linnæus's idea, but a *Serratula*. So likewise *Cotton-Thistle*^s having a honey-combed receptacle, is separated on account of that circumstance. Indeed the genus would

^q Cichoreum Endivia Lin.

^r Serratula arvensis Lin. Fl. dan. 644. Mor. hist. f. 7. t. 32. f. 14. Ger. 1173.

^s Onopordon Acanthium Lin. Mor. t. 30. f. 1. Ger. 1149.

have been too vast and unmanageable, without an attention to these marks, which might sometimes have appeared otherwise too minute. You have perhaps even heard it said that the *Artichoke*^c is nothing but a Thistle. It differs indeed very little; having a hairy receptacle, only the hairs being stiffer, it may be called bristly; and the structure of the down being the same: they differ principally in the calyx, for the scales in the Artichoke are *scariosæ* or ragged, fleshy, and terminated by a channelled appendicle, emarginate and pointed—a character which you may examine at your leisure at table. If you would speculate on the blue flowers; which being so large, will give a good idea of florets; at the same time that it is also an excellent instance of the order *Polygamia-Æqualis*, and the *Capitate* or *Headed* section of it; you must prevail on your gardener to let some heads stand long after the time that they should be cut for the table.

The *Burdock*, whose heads sometimes fasten themselves to your clothes as you pass, is in the same division with the Thistles: the globose form of the calyx, together with the hooked tops of the scales which compose it, are the essential characters of the genus. The common wild species^d has

^c *Cynara Scolymus* *Lin.*

^d *Arctium Lappa* *Lin.* Curtis, Lond. IV. 55. Ger. 809.

very large woolly heart-shaped leaves, petio-
late, and unarmed.

Of the third section, with *Discoid*, or as some call them, *naked discous* flowers, few are at hand. The banks of rivers and ditches will furnish a species of *Eupatorium*^v, a large plant with digitate leaves: usually there are three lobes to each leaf, which are hairy, and sharply ferrate, the middle one the largest; sometimes the side lobes are wholly wanting, and the leaf becomes simple: the stalks are lofty, rough, and quadrangular; and bear large bunches of small purple flowers on their tops, with about five florets in each calyx. The characters of the genus are an oblong, imbricate calyx, a naked receptacle; a feathered down, and a very long style, divided half way the length.

The same situations will produce you the *Bidens*; which has also an imbricate calyx: but the receptacle is chaffy; the corol is sometimes furnished with one floret alternately radiant; and the seeds are crowned with two erect, rugged awns, which being hooked make the seeds adhere to any thing that comes near them. We have two wild species, the *trifid*^w, so called from its trifid

^v *Eupatorium cannabinum* Lin. Fl. dan. 745. Mor. hist. f. 7. t. 13. f. 1. Ger. 711. Common Hemp-Agrimony.

^w *Bidens tripartita* Lin. Water Hemp-Agrimony. Curtis, Lond. IV. 57. Ger. 711.

leaves;

leaves; with erect seeds, and leafy calyxes: and the *nodding*^x, with lance-shaped, stem-clasping leaves, nodding flowers, and erect seeds. The corols of both are yellow; but those of the last, which is the least common, are most specious.

The second order of the class Syngenesia, entitled *Polygamia Superflua*, being scarcely less numerous than the first, is subdivided into two sections, the first containing the discoid, and the second, the radiate flowers: there is only one genus in this order with semiflosculous flowers.

Of the first section, with discoid flowers, you have the *Tansy*; which you find to have an imbricate, hemispheric calyx; the corols of the ray, or on the outside trifid; the others quinquefid; the seeds naked, being only slightly edged; and the receptacle naked. Sometimes in this genus there are no imperfect flowers. Our *common Tansy*^y, which not only the kitchen garden, but dry, upland pastures will furnish you with, has bipinnate, or twice-feathered leaves, which are gashed, and ferrated about the edges.

Southernwood^z, the *Wormwoods* and *Mugwort*^a, all range under the genus *Artemisia*;

^x *Bidens cernua* Lin. Nodding Water Hemp-Agrimony. Curtis, Lond. III. 55. Ger. 711.

^y *Tanacetum vulgare* Lin. Fl. dan. 871. Mor. hist. f. 6. t. 1. f. 1. Ger. 650.

^z *Artemisia Abrotanum* Lin.

^a *Artemisia vulgaris* Lin. Blackw. t. 431. Ger. 1103.

which has a calyx imbricate, with rounded, converging scales; naked seeds; and a receptacle either naked or with few hairs: the flowers have no ray whatever, but are strictly discoid. *Southernwood*^b is shrubby, erect, and has fetaceous leaves, very much branched: there is a *field* or *wild Southernwood*^c, with procumbent, twiggy stems, and multifid, linear leaves. *Common*^d and *Roman Wormwoods* and *Mugwort*^e have erect herbaceous stems, and compound leaves. The *Common*^d species has the leaves multifid, the flowers subglobose and pendulous, and the receptacle hairy. *Roman Wormwood* has the leaves many-parted, and downy underneath, the heads of flowers roundish and nodding, as in the other; but the receptacle naked. *Mugwort*^e has pinnatifid, flat, gashed leaves, downy underneath: the flowers are born in simple, recurved racemes, and have a ray of five flowers. *Common Sea Wormwood* has procumbent stems; many-parted downy leaves, nodding racemes, and three flowers in the ray.

Gnaphalium, comprehending many wild *Cudweeds* and the *Immortal* flowers, or *yellow* and *white Everlastings*; has an imbricate calyx, with the scales rounded, scarious, and coloured; a naked receptacle, and feathered

^b *Artemisia campestris* Lin. Ger. 1106.

^c *Artemisia Absinthium* Lin. Blackw. t. 17. Ger. 1096.

^d *Artemisia pontica* Lin. Jacq. austr. 1. t. 99.

^e *Artemisia maritima*. Ger. 1099.

down.

down. There are several species both of yellow and white Everlastings; the most known of the first, is common in Portugal, where they adorn their churches with the flowers, which are also sent annually to England: it is supposed to have been brought originally from India^f: the leaves are linear-lanced, and sessile: the flowers are born in a compound corymb, on elongated peduncles; and the stem is subherbaceous. One of the latter^g is very common in the gardens, and is originally of North America; this has leaves like the former, sharp-pointed, and alternate; the stems herbaceous, and branched above, the flowers in corymbs, with level tops. This has a very creeping root; and the stalks and leaves are woolly: the silvery calyxes, as well as the golden ones, of the former, if gathered before they are too open, will continue in beauty many years.

Xeranthemum or *Eternal flower* has an imbricate calyx, with the inner scales membranaceous, shining, and forming a set of coloured rays to crown the flower; the receptacle is mostly naked; and the down is either bristly or feathered. *Annual Xeranthemum*^h is an exception to the general

^f *Gnaphalium orientale* Lin. Comm. hort. 2. t. 55. Mor. hist. f. 7. t. 10. f. last.

^g *Gnaphalium margaritaceum* Lij.

^h *Xeranthemum annuum* Lin. Mill. illustr. Jacq. austr. 4. 388.

character, in having a chaffy receptacle; it is also the only one which has a down of five bristles; it is herbaceous, has lance-shaped spreading leaves; the outside florets have a simple stigma, with a naked seed; those in the middle have a sub-bifid stigma. The colour of the corol is either purple or white. There is a sort from the Cape with yellow flowersⁱ.

The second division of this order, with *Radiate* flowers, is much the largest. *Tussilago* or *Colt's-foot* has a cylindric calyx, with equal scales, from fifteen to twenty in number, as long as the disk of the flower, and a little membranous; a naked receptacle, and a simple or hairy down. *Common wild Colt's-foot*^k has angulate leaves, rather heart-shaped, with slight indentations about the edges, underneath white; and one yellow flower on a scape, which is imbricate or covered with scales. *Butter-bur*^l has vast leaves shaped much like those of the *Colt's-foot*; many (from ten to twenty) purplish flowers, collected into an ovate thyrse, on the top of a purplish scape set with scales of the same colour: there are sometimes from two to six imperfect, white, ligulate

ⁱ *Xeranthemum speciosissimum*. Seba 2. t. 43. f. 6.

^k *Tussilago Farfara* Lin. Curtis, Lond. II. 60. Ger. 811.

^l *Tussilago Petasites* Lin. Curtis, Lond. II. 59. Ger. 814.

florets,

florets, with scarcely any corol, among the others. You will not be able to examine all the specific characters of these two plants at once; for the naked stem which bears the flowers pushes up alone very early in the spring; and the leaves do not succeed till the flowers are past.

Senecio or *Groundsel* is a very numerous genus^m, having a cylindric calyced calyx, with the scales *sphacelate* or seeming mortified at top; a naked receptacle, and a simple down. Most of the species have radiate flowers, eight of them however have not, and among these is the *Common Groundsel*ⁿ, so vulgar a weed in kitchen gardens. *Stinking Groundsel*^o, a plant not very unlike this, has however radiate corols, with the semiflorets of the ray revolute; the scales of the calyx are loose; and the leaves are pinnatifid and viscid. This grows in hedge-rows and on heaths, and is a much taller plant than the last.

Common Ragwort^p has also radiate corols, with the ray however not revolute but expanding: the stem of this is erect; the leaves pinnatifid, approaching to lyrate, with

^m Fifty-nine species.

ⁿ *Senecio vulgaris* Lin. Curtis, Lond. I. 61. Ger. 278.

^o *Senecio viscosus* Lin. Dill. elth. t. 258. f. 336.

^p *Senecio Jacobæa* Lin. Mor. hist. f. 7. t. 18. f. 1. Ger. 280.

the divisions a little jagged. This is very common by road-sides and in pastures. The gardens have a *purple African Groundsel*^a from the Cape; an annual plant with a yellow disk, and purple rays: it agrees with Ragwort in having radiate corols with the ray expanding; the leaves are pinnatifid, equal, and very spreading, with a thickened recurved margin; and the scales of the calyx are thinly ciliated. A singular plant of this genus came up one year in my garden, which I took at first to be a new species; but, on more accurate examination, it proved to be a hybridous plant or mule, produced from this and the common Groundsel; it had the radiate flowers of the one, small indented and slightly tinged with purple, and the herb of the other: being annual, and producing no seed, this variety passed away with the season.

The two genera of *Aster* and *Golden-rod* furnish abundance of flowers that enliven the autumnal season, and continue till the severity of frost puts an end to them. They both agree in an imbricate calyx, a simple down, and a naked receptacle: but the inferior scales in the calyx of the *Aster* are spreading, and have a ragged appearance; whereas in the *Golden-rod* they are close: all the species

^a *Senecio elegans* Lin. Comm. hort. 2. t. 30. Seba mus. I. t. 22. f. 1.

also of the *Aster* have more than ten semi-florets in the ray, but the *Golden-rods* have only about five or six remote ones. Some of the *Asters* are shrubby, but most of them are tall herbaceous plants, dying down to the ground at the approach of winter, and rising again from the same root the ensuing spring: many are confounded under the vulgar title of *Michaelmas Daisies*. The *Amellus*, or purple Italian *Starwort*^r is one of the lowest species, but has large purple flowers, growing in a corymb on naked peduncles, with the scales of the calyx obtuse; the leaves are lance-shaped, obtuse, rugged, entire about the edges, and marked underneath with three nerves. The greater part of the perennial American *Asters* have scaly peduncles; some have entire, and others serrated leaves; hence a convenient subdivision of the genus: there are however some few species with serrated leaves and naked smooth peduncles. *Large flowering* or *Gatesby's Starwort*^s, is one of the handsomest; the flowers being large and of a deep purple; the calyx is ragged; the peduncles are scaly, and sustain only one flower; the leaves are quite entire, tongue-shaped, and clasp the stem. *Chinese Aster*^t is an an-

^r *Aster Amellus* Lin. Jacq. austr. 425. Virg. georg. edit. Mart. p. 368.

^s *Aster grandiflorus* Lin. Mart. cent. 19. Mill. fig. 292.

^t *Aster chinensis* Lin. Dill. elth. t. 34. f. 38.

nual plant, with ovate, angulate leaves, toothed about the edge, and petiolate; the flowers terminate the branches, and have spreading leafy calyxes. The variety of colour, and size of the corol, have made this species very generally cultivated: the frequent duplicity of them, will not induce you to mistake a double radiate, for a natural ligulate flower; which, to an unobserving eye, it perfectly resembles. The salt-marshes on the sea-coast of Europe furnish one species, called *Sea-Starwort*^u: this has lance-shaped, entire, fleshy, smooth leaves; the branches are unequal; and the flowers in a corymb.

Of the *Golden-rods* we have only one European species^v, unless we distinguish the *Welsh Golden-rod*^w, which seems but an humble variety. The stem is a little flexuose or winding; and the flowers grow in erect, crowded, panicked racemes. The Welsh variety has the leaves a little hoary underneath, and roundish clustered spikes at the top of the stalk, with larger flowers appearing earlier than the common sort: in lofty situations and dry soils, a stem will sometimes produce one flower only. North Ame-

^u After *Tripolium* *Lin.* Fl. dan. 615. Mor. hist. f. 7. t. 22. f. 36, 37. Ger. 413.

^v *Solidago Virgaurea* *Lin.* Fl. dan. 663. Mor. t. 23. f. 4. Ger. 430.

^w *Solidago cambrica* *Huds.* Petiv. herb. Brit. t. 16. f. 11.

rica has furnished abundance of species, whose golden racemes of flowers mix happily with the purple corymbs of the Asters; and thus they jointly enliven plantations of shrubs in the latter season.

Inula, of which *Elecampane*^x is the leading species, has the following characters—a naked receptacle; a simple down; and the anthers ending at the base in two bristles: this structure of the anthers is *unique*—the cylinder is composed of five smaller linear anthers, each ending in two bristles, of the length of the filaments. The true *Elecampane*^x is distinguished by its large, stem-clasping, ovate, wrinkled leaves, downy underneath; and by the ovate form of the scales of the calyx. The stalks are three feet high, and divide towards the top into several smaller branches, each of which is terminated by one large yellow flower. The *Flea-banes* *middle*^y and *less*^z are of this genus; the first is common in moist meadows, and has stem-clasping, oblong leaves, hollowed next the petiole; a villous stem terminated by yellow flowers in panicles; and the scales of the calyx bristly. The second^z has also stem-clasping leaves, but

^x *Inula Helenium* *Lin.* Fl. dan. 728. Mor. hist. f. 7. t. 24. f. last. Ger. 793.

^y *Inula dysenterica* *Lin.* Curtis, Lond. III. 56. Ger. 482.

^z *Inula pulicaria* *Lin.* Curtis, Lond. III. 57. Ger. 482.

waved;

waved; prostrate stems; and subglobular flowers, easily known by the shortness of the ray. The place of this is by road-sides, and where water stands in winter.

Doronicum or *Leopard's-bane*, a wild plant of the Alps, and now common among the perennials of the garden, has the scales of the calyx in two rows, equal, and longer than the disk; the seeds of the ray naked or destitute of down; those of the disk crowned with a simple down; the receptacle naked. The common species, above alluded to^a, has heart-shaped leaves, slightly indented about the edge, and obtuse at the end; those at the root petiolate, those above stem-clasping. The stalks are channelled and hairy, near three feet high; these put out a few side branches, each of which is terminated by a large yellow flower. A second species^b has ovate, acute leaves, slightly indented, and alternate branches. A third^c has a naked, simple stem ending in one flower: and these make up the whole genus.

Tagetes has a one-leaved, five-toothed, tubular calyx; five permanent florets to the ray; the seeds are crowned with five erect awns; and the receptacle is naked. *French*^d and

^a *Doronicum pardalianches* Lin. Mill. fig. 128. Jacq. austr. 4. t. 350.

^b *Doronicum plantagineum* Lin.

^c *Doronicum Bellidifolium* Lin. Jacq. austr. 4. t. 400.

^d *Tagetes patula* Lin.

African

African^e Marigolds, two of the gaudy annuals of the flower garden are of this genus. The first is distinguished by a subdivided spreading stem; the second, by an erect, simple stem, with naked, one-flowered peduncles. Of both these, as you well know, there are many varieties in colour, from pale brimstone to deep orange; and the more they deviate into duplicity, so much the more does your gardener value himself on his skill or good fortune.

Chrysanthemum, so named from its golden-coloured flowers, is known by its hemispheric, imbricate calyx, formed of close scales, the inner ones gradually larger, and the inmost membranous or chaffy; there is no down to the seeds, but they are only edged or margined; the receptacle is naked. Some of the species are improperly termed *Chrysanthema*, having white rays to the flowers: of these we have an instance in the *Ox-eye Daisy*^f, a plant common among standing grass in meadows, and having oblong, stem-clasping leaves, sawed above, and toothed below. *Corn Marigold*^g, which is a weed among the corn in sandy lands, has yellow rays, and stem-clasping leaves, jagged above, and toothed below; they are smooth, and of a glaucous hue. Lest you should think the colour of more

^e *Tagetes erecta* Lin.

^f *Chrysanthemum Leucanthemum* Lin. Blackw. t. 42. Mor. hist. f. 6. t. 8. f. 1. Ger. 634.

^g *Chrysanthemum segetum* Lin. Mor. t. 4. f. 1. Ger.

importance than it really is, I will put you in mind, that the species so commonly cultivated in flower gardens, under the name of *Chrysanthemum creticum*^b, has both yellow and white rays: these flowers are esteemed in proportion as they deviate from nature; but the plant may always be known, by the pinnate, gashed leaves, growing broader towards the end.

The three genera of *Matricaria*, *Cotula*, and *Anthemis*, are nearly allied. The first has a hemispheric, imbricate calyx, with the marginal scales solid, and rather acute: the seeds have no down; and the receptacle is naked. The second has a convex calyx; the florets of the disk quadrifid; those of the ray have only a germ with its style and stigmas, without any corol: there is no down, but the seed is margined: and the receptacle is naked, or nearly so. The third has a hemispheric calyx, with the scales nearly equal; more than five semiflorets in the ray; no down; and a chaffy receptacle. There are plants vulgarly known by the name of *Mayweed* or *Camomile*, in each genus. *Common Fever-few*ⁱ also is a species of *Matricaria*: the leaves are compound and flat, the lobes or divisions are ovate, and gashed, and the peduncles are branched: it

^a *Chrysanthemum coronarium* Lin. Mor. t. 4. f. 2, 3.

ⁱ *Matricaria Parthenium* Lin. Fl. dan. 674. Ger. 652.

grows

grows upon banks, has a strong, unpleasant scent, the leaves are of a yellowish green, and the rays of the flower are white: admitted into gardens, it has generally double flowers. *Common or true Camomile*^k is an *Anthemis*; and has compound pinnate leaves, the divisions linear, acute, and a little villous. It sometimes covers a considerable extent of ground on dry sandy commons, trailing along, and putting out roots from the stalks; its agreeable odour betrays it as we tread upon it: that which is found in gardens, has usually lost all character by cultivation.

Achillea or *Milfoil* has an oblong-ovate imbricate calyx; from five to ten semiflorets in the ray; no down; and a chaffy receptacle. *Common wild Milfoil* or *Yarrow*^l has bipinnate naked leaves, the divisions of which are linear and indented; the stems are furrowed above. It is a vulgar plant in pastures, and particularly by way-sides; for it seems to delight in being trod upon, and in such places spreads itself abundantly. The usual colour of the flower is white, but it sometimes varies to a fine purple. Other foreign species are yellow.

The four remaining orders of this class being much less numerous than the two

^k *Anthemis nobilis* Lin. Ger. 755.

^l *Achillea Millefolium* Lin. Fl. dan. 737. Mor. hist. f. 6. t. 11. f. 6, 14. Ger. 1072.

which

which we have already examined, there is not the same occasion for subdivisions ; and accordingly Linnæus has not made any. The third order of *Frustraneous Polygamy* comprehends no more than seven genera, from which I shall select two — *Helianthus* and *Centaurea*. The first has an imbricate calyx, rather squarrose, or having a ragged appearance from the spreading of the tips of the scales ; a two-leaved or two-awned crown to the seeds ; and a flat chaffy receptacle. Every species of this genus is a native of America alone, and on the discovery of the new world, some of them were vaunted as miracles of nature, though they are now become so common, as almost to be disregarded. The *annual Sun-flower*^m however it must be acknowledged is a flower of wonderful magnificence, and owes the diminution of regard to the facility of its propagation : the specific characters are heart-shaped leaves, marked with three principal nerves ; peduncles thickening immediately under the calyx ; and the flowers nodding. No flower is more proper than this, from its great size, to give you an idea of a compound flower, and its component floscules, or florets and semiflorets ; only you will remember not to expect seeds from those of the ray, that being the character of the order. This plant

^m *Helianthus annuus* Lin. Mill. illustr.

had its name from the form of the flower, not from any power it possesses of turning towards the sun: there is usually but one flower on a stalk, but I had four in my garden on a single stem, looking to the four cardinal points. *Perennial Sun-flower*ⁿ is yet more common than the last, because it spreads much at the root, and requires no care in the cultivation: the inferior leaves of this are heart-shaped and three-nerved, but the upper ones ovate. The flowers, though much smaller than those of the last, are yet the largest and most sightly of the perennial sorts, and the same plant produces abundance of them. You will be on your guard against double flowers. The perennial sorts seldom produce seeds in our climate: whereas the annual, which can be propagated no otherwise, has them in plenty. *Jerusalem Artichoke*^o is also a species of *Helianthus*; the leaves are *ovato-cordate*, or egg-shaped, only hollowed at the base; they are also marked with three principal nerves: this frequently does not even flower, but it is cultivated not for the sake of these, but the tuberos or knobbed roots, resembling in form the potatoe, but in taste an artichoke bottom. There is a species which has the common

ⁿ *Helianthus multiflorus* Lin. Pluk. phyt. 159. f. 2.

^o *Helianthus tuberosus* Lin. Jacq. hort. 2. t. 161.

or trivial name of *giganteus* or *giant*: *Jerusalem Artichoke* justly merits the same title, for I have measured stems of it twelve feet high.

Centaurea is a most numerous genus of the same third order, containing no less than sixty-six species. The corols of the ray are funnel-form, or tubular, longer than those of the disk, and irregular; the down is simple; and the receptacle has bristles between the florets. This otherwise unweildy genus is commodiously subdivided into six sections, by the variations of the calyx, which you observe make no part of the generic character. I. Plants commonly called *Jaceas*, with smooth, unarmed calyxes. II. *Cyanuses*, with the scales of the calyx sawed and ciliated. III. *Rhaponticums*, with dry, scariose scales, like chaff, or as if parched. IV. *Stoebes*, with the spines of the calyx palmated. V. *Calcitrapas*, with the spines of the calyx compound or subdivided. VI. With the spines simple or wholly undivided. To the first section belongs the *Sweet Sultan*^p, which has a roundish calyx with ovate scales; and lyrate leaves, indented about the edge. It is an annual plant, with purple flowers, of a sweetness so powerful as to be offensive to many persons; they come out singly on long naked peduncles, and frequently vary to flesh colour and white.

^p *Centaurea moschata* *Lin.* *Mor. hist.* f. 7. t. 25. f. 5.

There

There is a yellow Sweet Sultan, which differs not only in the colour of the flowers, and in having a milder odour, but also in having the edges of the leaves serrate: it is doubtful however whether it be a distinct species from the former. The *Great* or *Officinal Centaury*¹ is also of this section: the scales of the calyx are ovate; the leaves are pinnate, and the lobes or divisions serrate and decurrent. The plant is large and tall, and the flowers are purple.

Of the second subdivision we have three plants commonly wild, and one little less common in gardens. *Common* or *Black Knapweed*², perhaps more properly *Knob-weed*, which the country people in some places call *Hard-heads*, is found in almost all pastures, and is one instance among many others, of the vile weeds which are suffered to occupy grass fields with impunity: the scales are ovate, with erect, capillary *ciliæ* or fringes: the leaves are lyrate and angulate; and the flowers are flosculous. *Great Knapweed*³ has pinnatifid leaves, with the lobes lanceolate. This grows in corn fields and on balks. The flowers of both are red; but those of the latter are much the largest and most specious. *Blue-bottle*⁴ the

¹ *Centaurea Centaureum* Lin.

² *Centaurea nigra* Lin. Ger. 727.

³ *Centaurea Scabiosa* Lin. Mor. hist. f. 7. t. 26. f. 3. Ger. 727.

⁴ *Centaurea Cyanus* Lin. Mor. t. 25. f. 4. Ger. 732.

third wild plant of this section, which every body knows for an universal weed among corn, and whose beautiful blue colour would have attracted regard, had it been rare; has linear leaves, which on the stem are quite entire; towards the ground they are broader, indented about the edges, and sometimes pinnate. *Mountain Blue-bottle*^u, which has migrated from the Swiss mountains into our gardens, is very nearly allied to this, but its flowers are much larger: the leaves also are lance-shaped and decurrent, and the stem is quite simple, whereas the wild sort is branched. *Carduus Benedictus* or *Blessed Thistle*^v is an instance of the fourth section: it has doubly spined, woolly calyxes, furnished with an *involucre*; the leaves are semi-decurrent, indented, and prickly: this is a small annual plant with yellow flowers. We have a wild species of this section — the *Star-thistle*^w, growing by road-sides, and in dry pastures, but not every where: it has sessile flowers, with the calyxes rather doubly spined; the leaves pinnatifid, linear, and toothed; the stem hairy, and much branched: the spines of the calyx are white, and the flowers red. Of the other sections none are likely to meet your eye; indeed the roughness

^u *Centaurea montana* Lin. Mill. fig. 114.

^v *Centaurea benedicta* Lin.

^w *Centaurea Calcitrapa* Lin. Ger. 1166.

and

and vulgarity of their habit, in which they much resemble Thistles, have occasioned the numerous species to be little cultivated.

The *Marigold* of the kitchen garden will furnish a familiar instance of the fourth order—*Polygamia Neccessaria*. The genus is known by a calyx of many equal leaves; by the seeds having no down, and those of the disk being membranous: and by the receptacle being naked. The *common* or *officinal*^x, species is distinguished in having all the seeds boat-shaped, bent inwards and muricate.

In the *Segregate* order, besides the calyx or perianth common to the whole flower, there is a secondary one, including several floscules, or sometimes one only; this forms one character of the genera. *Echinops* has only one flower to each partial calyx: besides this, the floscules are tubular, and complete; the seeds have an obscure down; and the receptacle is bristly. *Common Globe-thistle*^y is so called from the flowers growing in globular heads: the leaves are sinuous and pubescent, the jags ending in spines; the flowers are blue, and sometimes white.

We have now done with the natural tribe of compound flowers, but there re-

^x *Calendula officinalis* Lin. Mill. illustr.

^y *Echinops sphærocephalus* Lin. Mill. illustr.

mains yet one order of the class *Syngenesia*, in which the flowers are totally different, except in the common character of the union of the five anthers; they are simple, like the flowers of other classes, or have only one corol inclosed within the calyx without any common perianth. The *Violet* will furnish you with a number of notorious examples of this order. All the species, which are twenty-eight, agree in a five-leaved calyx; a five-petalled, irregular corol, produced into a horn or spur behind; and in a three-valved, one-celled capsule, above the receptacle, or inclosed within the calyx, the *Sweet Violet*^z, that scents the banks, hedges, and borders of woods, in the spring, with its fragrant purple flowers, is one of those which have no stalks, except the scape which supports the flower, and the runners by which they are propagated; the leaves are heart-shaped. The corols are sometimes white, and the gardens boast a large double variety. This is one of the few wild plants, whose allowed merit has secured it a place in every cultivated spot. The later species without scent, commonly called *Dog Violet*^a, is one of the caulescent or stalky kind, the more adult stems ascending; the leaves are heart-shaped, but drawn

^z *Viola odorata* *Lin.* Curtis, Lond. I. 63. Ger. 850.

^a *Viola Canina* *Lin.* Curtis, Lond. II. 61. Ger. 851.

to a point at the end: the corol is paler than that of the Sweet Violet, and having leaves proceeding from a stalk, cannot be mistaken for that, in which they grow immediately from the root, even if the odour were not attended to. *Heart's-ease* or *Pansies*^b, the universal favourite of the more simple, unrefined ages, is one of those which have pinnatifid stipules, and an urceolate or pitcher-shaped stigma; it has also a three-cornered, diffuse stem; and oblong gashed leaves. such are the characters of a plant, which every child becomes acquainted with as soon as he can walk into a garden: but it is not therefore wholly useless to mention it, because it may at least serve to explain several terms to you, and to assist you in the examination of plants with which you are not so well acquainted.

When we compare the diminutive and almost colourless Pansy, which we find wild among the corn, with the ample rich-coloured corol, that boasts the tissue of velvet, such as we see in some curious gardens; we cannot but allow that human art has

^b *Viola tricolor* *Lin.* Curtis, Lond. I. 65. Fl. dan. 623. Ger. 854. This has numberless provincial names, bearing some allusion to love.

“ Yet markt I where the bolt of Cupid fell,
 “ It fell upon a little western flower,
 “ Before milk white, now purple with Love's wound,
 “ And maidens call it *Love in Idleness*.”

Midsom. Night's Dream. II. 2.

made a considerable improvement; and we survey it with the more pleasure because it is not at the expense of the natural characters of the flower: and you may enjoy it both as a botanist and a florist.

That beautiful flower called *Balsam*, is of this order. Linnæus names the genus *Impatiens*, because the capsule when ripe, is impatient of the touch, easily bursting, and thus throwing out its seeds. It has an irregular corol of five petals like the violet, when it has not been improved into beautiful duplicity by culture; but the calyx is two-leaved; the nectary or horn is cucullate or cowl-shaped; and the capsule is five-valved. *True Balsam*, or more properly *Balsamine*^c, has the leaves lance-shaped, those on the upper part of the plant alternate; the flowers come out three or four together, from the joints of the stalk, only one on each slender peduncle; and the nectary is shorter than the flower: the varieties of colour—white, red, purple and variegated, are well known. That which comes from the East-Indies has larger, finer flowers than what comes from the West, most beautifully variegated with scarlet and white, or purple and white. We have a wild species called *Yellow Balsam*, and also by the familiar names of *Quick in hand*, or *Touc*

^c *Impatiens Balsamina* Lin. Mill. fig. pl. 59.

me not^d: one long slender peduncle comes out from the *alæ*, which subdivides into several others, each sustaining a yellow flower; the leaves are ovate; and the stem swells at the knots. This is a local plant, being observed only or chiefly in Westmoreland and Yorkshire, in moist shady places, or by the sides of lakes and rivers.

You have now abundant amusement for your autumnal walks; and as the season for examination will be over, before I shall have leisure to prepare you fresh matter for future amusement, I take leave of you till the ensuing spring; when, if health and leisure permit, we shall travel through the few remaining classes.

^d *Impatiens noli tangere* *Lin.* Fl. dan. 588. Ger. 446.

L E T T E R XXVII.

May the 1st, 1777.

I RENEW our pursuit as early as possible, my dear cousin, in order that I may be able to accomplish my purpose of completing our original scheme, during the course of the present season.

The twentieth class, which falls now under our consideration, is entitled *Gynandria*, from a circumstance peculiar to it, which is that of having the stamens situated upon the style itself. You have remarked, that in every class hitherto examined, these two parts are entirely independent, so that we can at any time remove the one from a flower, and leave the other; but in the class *Gynandria* this is not permitted us; the stamens usually growing out of the pistil itself; but in some cases upon a receptacle, produced or lengthened in form of a style, which bears both pistil and stamens. This class has nine orders, founded on the number of stamens in the flowers of each; the genera are 33, and the species 275.

The first order, called *Diandria*, from there being two stamens only to the flowers in it, is perfectly natural; that is, contains a tribe of plants agreed upon by all the world to be in strict alliance; or such, as when
an

an eye properly informed has seen one of them, it immediately refers any of the others to the same tribe, clan, or family, as soon as they occur. Indeed the alliance between the greater part of these plants is so strict, that some nomenclators have been induced to refer them to one genus, or one family properly so called: for the genera differ hardly in any thing else from each other but in the shape of the nectary. Some former nomenclators had established the genera upon the roots, which are certainly the part least proper for this purpose, because you cannot examine the character, without destroying the plant. But they were induced to it, from the singular form of the roots in this tribe: which in some species are a pair of solid bulbs; in others a set of oblong fleshy bodies tapering to the extremities, and spreading out like the fingers, whence they have the name of *palmate* or *banded*.

Having said so much of this tribe, it is almost time, you think, to be acquainted with the singular personages that compose it. The far greater number of them then have the common appellation of *Orchis*, a name I am persuaded you are not wholly unacquainted with.

Take one of these flowers, of any sort you can meet with; or if no species is yet in blow, you will not have long to wait for
 some

some of them. You will find an oblong, wreathed germ, below the flower, which has no proper calyx, but only spâthes or sheaths: the corol is made up of five petals, the two innermost of which usually join to form an arch or helmet over the top of the flower; the lower lip of the corol forms the nectary, taking the place of the pistil and a sixth petal: the style adheres to the inner edge of the nectary, so that, together with its stigma, it is scarcely distinguishable: the filaments are very short, and each of them is terminated by an anther, that has no covering, but has the texture of the pulp of oranges or lemons; each is lodged in a cell opening downwards, and adhering to the inner margin of the nectary; so that without this information you might have been at a loss where to find the stamens, unless they happened to have burst from their cells: the germ in time becomes a capsule, of three valves, opening at the angles under the carinated ribs; within is only one cell, and a great number of small, irregular seeds, shaped like sawdust, are affixed to a linear receptacle on each valve. I have been more particular on the character of this tribe, because the flowers have rather a strange and unusual appearance, owing to the singular position of the parts of fructification. There is a connexion between this and the liliaceous tribe; both having but one lobe to the seed, succulent

lent roots, entire leaves, and a naked corol: they differ however in the number of stamens, the form of the corol and nectary, the situation of the germ, the number of cells in the capsule, the shape and arrangement of the seeds: this tribe also bears its flowers on a spadix, and has bractes interposed between them.

The principal genera of this tribe are thus distinguished:

- Nectary horn-shaped. *Orchis*.
- bag-shaped. *Satyrium*.
- slightly keeled. *Ophrys*.
- ovate, gibbous underneath. *Serapias*.
- pedicelled. *Limodorum*.
- inflated. *Cypripedium*.
- turbinate or top-shaped. *Epidendrum*.
- connate with the ringent corol. *Arethusa*.

The *Orchis* is the largest genus, there being no less than fifty species, of which eleven are found wild in England. The greater number have double bulbs; in the rest the roots are either palmate or fasciculate.

Of those with double bulbs, woods and bushy pastures produce the *Butterfly Orchis*^e, which has the lip of the nectary lance-

^e *Orchis bifolia* *Lin.* Fl. dan. 235. Vaill. par. t. 30. f. 7. Mor. hist. f. 12. t. 12. f. 18. Ger. 211.

shaped

shaped^f and quite entire: the horn very long; and the petals spreading out wide. The flowers of this smell sweet, particularly in an evening, and very early in the morning. There are only two, or at most three large leaves: the stem is a foot, or eighteen inches high: the spike is long, but the flowers are thinly spread in it; the bractes are large, and of the length of the germ: the flowers are of a greenish white; the spur is twice as long as the germ, very slender, and transparent enough for you to discern the nectar through it. There is a smaller variety, but differing no otherwise than in size.

Pyramidal Orchis^g, found in pastures where the soil is chalky, is another of those which have double bulbs: the lip of the nectary is two-horned, trifid, the segments nearly equal, the middle one being rather the narrowest; all of them are quite entire; the horn, or spur, is cylindric, slender, and longer than the germ; and the petals are nearly lance-shaped. This is an elegant species, having six or more radical leaves; the stem a foot, or eighteen inches high; the spike of flowers short, of a broad conical form, and very thick set at first; the bractes at least equal in length to the germs, lance-shaped,

^f Haller says linear.

^g *Orchis pyramidalis* *Lin.* *Raii syn.* t. 18. *Jacq. austr.* t. 266. *Vall.* t. 31. f. 38. *Rivin.* t. 14. *Hall. helv.* t. 35.

and ending in a point; the corol bright purple.

Two of the most common sorts with double bulbs, are foolishly called *Male* and *Female Orchis*, because there is no distinction of sexes; and therefore these names are only calculated to mislead. The first^k differs from the second in having the outer petals more acute and longer; and the middle lobe of the lip bifid and longer than the side ones: it is also a much larger plant, with broader leaves, usually spotted. The secondⁱ has the lip of the nectary crenulate, or slightly notched on the sides, trifid, with the middle lobe emarginate, and the petals obtuse and linear. The height of this seldom exceeds seven or eight inches; the leaves are half an inch broad; and the spike is cylindric, and has few flowers; the bractes are coloured, and a little longer than the germs; the petals forming the helmet converge, and are marked with green parallel lines; the middle of the lip is spotted, and the sides are rolled back; the horn is equal to the germ, with the end emarginate; the most common colour of the corol is deep purple, but it varies to rose-coloured, and even white. The first is a foot, and even eighteen inches high; the leaves an inch

^k *Orchis mascula* Lin. Curtis, Lond. II. 62. Vaill. t. 31. f. 11, 12. Ger. 208.

ⁱ *Orchis morio* Lin. Curtis, Lond. III. 59. Vaill. t. 31. f. 13, 14. Ger. 208.

and half broad; the spike handsome, long, and thin set with flowers; the bractes about the same length with the germs, purple and lance-shaped; the petals that form the helmet loose, not converging, they are purple, with lines of the same colour; the edges of the lip are bent downwards, the colour pale purple, with deeper spots at the chaps; the spur is straight, thick, as long as the germ, or longer, dilated and compressed at the end. The colour of the corol varies, even to white. This grows in meadows; and the roots make excellent *Salep*. The second affects open dry pastures. Thus you have abundant means of distinguishing these two species of *Orchis* from each other; and the roots are a sufficient mark of distinction from two others, no less common, which we shall examine presently. In the mean time, there is a small but pretty species with double bulbs, which we must not pass by. It grows chiefly on dry exposed chalk hills, and is called *Dwarf Orchis*^k: the lip of the nectary is quadrifid, and white dotted with purple; the horn is obtuse, and the petals are distinct. The height is from four to seven inches: there are several leaves next the ground, but few on the stem: the spike is short and close set; the bractes are shorter

^k *Orchis ustulata* *Lin.* Fl. dan. 103. Hall. t. 28. Vaill. t. 31. f. 35, 36. Mor. t. 12. f. 20. Ger. 207.

than the germ ; the helmet is pointed, and of a deep purple on the outside : within the petals are marked with lines and dots of purple ; the horn is a little bent, and not half the length of the germ.

Two very common species with palmate, or handed bulbs, are the *broad-leaved*¹ and *spotted Orchis*^m, generally found in moist meadows. The first has the roots rather palmate and straight ; the horn of the nectary conic, the lip three-lobed, and turning back on the sides ; the bractes large, and longer than the flowers, so as to give the spike a leafy appearance. The horn is shorter than the germ, bent and obtuse. The colour of the corol is purple, varying to rose and white. The second has narrower leaves, and a solid stem, whereas that of the first is hollow ; it is also higher, and flowers later ; the leaves of both are spotted with black, but this more generally ; the bractes are smaller and narrower ; the corol of a paler purple ; the lip of the nectary is deeper cut, the side lobes are notched, the middle one very narrow, quite entire, and drawing more to a point.

I shall mention only one species more of

¹ *Orchis latifolia* *Lin.* Mill. illustr. Fl. dan. 266. Hall. 32. Vaill. t. 31. f. 1—5. Ger. 226. f. 1, & 222. f. 3.

^m *Orchis maculata* *Lin.* Hall. t. 32. Rivin. t. 8, & II. Vaill. t. 31. f. 9, 10. Ger. 220.

Orchis, and that also has palmate roots: it is found in pastures, but by no means so common as the two last: you may call it *long-spurred*, or *sweet Orchis*^a, and you will know it by the great length and slimness of the spurs: the lip is trifid, equal, slightly notched, and obtuse; and the side petals spread out very wide. The stem is leafy, and grows to the height of eighteen inches; the bractes are sharp pointed, and of the length of the germ; the corol is purple, and all of one uniform colour; the smell is strong, but, in some circumstances, sweet.

The second genus of this natural tribe is the *Satyrion*, which instead of the horn, or spur, has a short bag-form, or double-inflated nectary, at the back of the flower. This is a much less numerous genus than the last, having only eight known species. Of these I shall select two; *Lizard Satyrion*^o, and *Frog Satyrion*, commonly called *Frog Orchis*^p. The first is found in chalky pastures, but rarely; and has been rendered more rare by the diligence with which it has been sought after, to transplant it into gardens, where it seldom continues long, this tribe being generally abhorrent of cul-

^a *Orchis conopsea* Lin. Fl. dan. 224. Hall. t. 29. Rivin. t. 11. Vaill. t. 30. f. 8. Ger. 222.

^o *Satyrion hircinum* Lin. Hall. t. 25. Mor. t. 12. f. 9. Ger. 210.

^p *Satyrion viride* Lin. Fl. dan. 77. Hall. t. 26. Ger. 224.

ture. It has double undivided bulbs; lance-shaped leaves; the lip of the nectary trifid, the middle lobe linear, oblique, extremely long, flaunting like a ribband, and seeming, as it were, bitten off at the end. It is a very large lofty plant, from eighteen inches to three feet in height; the leaves also are half a foot long and more, and three inches broad; the spike has many flowers, and, by age, grows very long and bent; the bractes are slender, acute, greenish, and twice as long as the germs; the colour of the corol is greenish without, and rusty within, with purple lines and spots: the flower has a strong goatish smell.

Frog Orchis is much more common in meadows. The bulbs of this are palmate; the leaves oblong and obtuse; the lip of the nectary trifid, with the middle lobe obsolete, or so small as to be obscure. This is a much lower and smaller plant than the former, not being above seven or eight inches high: the radical leaves are broad and ovate; those on the stem, which are few, lance-shaped: the spike is rather thin set with flowers; the bractes are lance-shaped, and longer than the germ: the helmet is almost closed, pale green, with a purple line dividing the petals; the lip is yellow, hangs down straight, and grows broader towards the end; the whole corol becomes dusky red with age.

The third genus of the *Orchis* tribe is
 E c entitled

entitled *Ophrys*: it has no horn or bag at the back of the corol, but one petal longer than the rest, hanging down, and marked underneath with a longitudinal rising, called the keel. This it is which in some species takes the form of an insect so exactly, as to appear real at a certain distance.

One species, called *Common Twayblade*^a, or *Twyblade*, from its having always two leaves, and no more, is frequent in woods and bushy pastures. It has fibrous roots, two ovate leaves, and the lip of the nectary bifid. The stem is eighteen inches high, rather rough or hairy, and naked, except the two large leaves in the middle, between the root and the spike, which is sometimes six inches long, and has forty flowers, thin set on short peduncles; the bractes are very small, broad, and sharp-pointed; the germ is round, and thicker than in any other of the species; the corol is of a greenish yellow.

The latter end of summer and beginning of autumn flowers the *Spiral Ophrys*, commonly called *Triple Ladies Traces*^r; you will find it on heaths and dry pastures. The root consists of oblong aggregate bulbs; the stem is a little leafy, the flowers are spiral, and all on one side of the stem; and the lip of the nectary is undivided and slightly

^a *Ophrys ovata* *Lin.* Curtis, Lond. III. 60. Ger. 402.

^r *Ophrys spiralis* *Lin.* Curtis, Lond. IV. 59. Ger. 218.

notched. This is a small plant, seldom above five or six inches high, though in a less dry soil it will rise to a foot; it has four or five leaves next the ground; the spike is long and slender, having twenty flowers, white within and yellowish without; the bractes are not flat, but hollow, and longer than the germ; the three outer petals of the corol are glued together; the lip is roundish and ciliate. It has a pleasant odour.

But the most interesting and admired species of this genus, are the *Fly* and *Bee Orchises*, which agree in having two roundish bulbs, and a leafy scape or stem. Linnæus thinks the *Fly* and the two Bees not to be specifically different, but in this I cannot agree with him. *Fly Ophrys* or *Orchis*^t has the lip of the nectary quadrifid; in the common *Bee Orchis*^u it consists of five lobes, which are deflexed or bent downwards; and in the *green-winged Bee Orchis*, now called *Spider Ophrys*^v it is roundish, entire, emarginate, and convex. But besides this character from the lip of the nectary, the *Fly* is a stiffer, straighter plant than the *Bee*, not so

^s *Ophrys insectifera* Lin.

^t *Orchis musciflora* Halleri. 1265. t. 24. *Ophrys insectifera myodes* Lin. *Oph. muscifera* Hudf. Vaill. t. 31. f. 17, 18. Ger. 213.

^u *Orchis fuciflora* Hall. *Ophrys apifera* Hudf. Curtis, Lond. I. 66. Ger. 212.

^v *Ophrys insectifera arachnites* Lin. *Oph. aranifera* Hudf. Vaill. t. 31. f. 15, 16.

leafy, and having the flowers thinner set; in other respects they are much alike, except in the corols, which are widely different: that of the Fly has the three outer petals ovate, entire, smooth, herbaceous, and spreading; the two inner linear and dark purple; the lip of the nectary oblong, dark purple above, and herbaceous underneath, with a blue spot or band below the upper lobes. *Bee Orchis* has the three outer petals spreading, oblong, and purple, marked with three green nerves; the two inner lateral ones linear, villous, and green; the lip of the nectary large, roundish, purple, and like velvet, the lobes deflexed, with a double variegated yellow, smooth, shining spot at the base. *Spider Orchis* is a lower plant, the lip of the nectary is of a less cheerful colour, without any of the yellow that decorates the *Bee*, and both helmet and wings are green: the three outer petals are oblong and spreading, the inner linear and shorter; the lip of the nectary is large, roundish, entire, emarginate, convex, and appearing like velvet, dusky purple above, with a green edge, and a double spot at the base; beneath it is herbaceous. These three beautiful plants are found among grass in a chalky soil, and form a succession from April to August: the *Spider* comes first in April and May, the *Fly* next in June, and last of all the *Bee* in July and August.

I have been the more particular on this singular tribe of plants, because spurning culture they are not liable to essential changes, or indeed to any that I know of, except in colour: you must also search for them abroad, and consequently unite exercise with study, which is one of the principal advantages of Botany; for I cannot allow you to gather plants by proxy, since you would thus lose half the pleasure of the pursuit, as well as the benefit: and why should you not have as much enjoyment in searching for a beautiful plant, or finding an elegant flower, as the men have in looking for a hare, or shooting a partridge. I will only add, that should you be so happy as to meet with the *Lady's Slipper*^w, you would be highly delighted with its singular, large, hollow, inflated nectary, the form of which has given occasion to the name. Haller however observes, that it has more resemblance to a wooden shoe in form, and therefore is unworthy the title of *Venus's Slipper*, which Linnaeus has bestowed upon it. Without entering into this important dispute, I will observe to you, that the root is fibrous; the stem about a foot high, and leafy: the two first leaves small, and keeping almost close to the stalk; the rest, (from four to seven) ovato-lanced: one, or at most two flowers

^w *Cypripedium Calceolus* Lin. Mill. fig. 242.

come out on the same stem, of which there are sometimes several from the same root: the bracte is very large, as is also the germ: there are but four petals to the flower, spreading out almost at right angles to each other, and often convolute; their colour is purple; of the two outer petals, one stands up above the nectary, the other hangs down behind it; the two inner petals stand out sideways, and are narrower: the slipper or lip of the nectary is yellow, spotted within, and marked longitudinally with ridges and furrows.

In the order *Pentandria*, you will find the numerous and beautiful genus of *Passion-flower*. The flowers have three pistils, a five-leaved calyx, five petals to the corol, a radiate crown for a nectary; and the fruit is a berry on a pedicle. None of the species are European, but mostly natives either of New Spain, the Brasils, or the West-Indian Isles; so that they require the protection of the conservatory at least, if not of the stove, except one or two, which will stand abroad in a sheltered situation, with a little attention, in severe weather. I shall select the species which you are most likely to meet with, rather than the rarest. *Blue Passion-flower**, though a native of the Brasils, is seldom injured with us, except in very severe winters. Against a house

* *Passiflora cærulea* Lin. Mill. illustr. Duham. arb 1. t. 107.

it may be trained up to the height of forty feet, and throws out annually slender shoots, fifteen or sixteen feet long: the leaves are palmate or handed, composed of five smooth, entire, obtuse lobes, the middle one longest, the outer shortest, and often divided; they are petiolate, the petioles have two glands, and at their base is a stipule in form of a crescent, and a long clasper, by which the slender shoots support themselves: the flower comes out at the same joint with the leaf, on a peduncle near three inches long; round the centre of it are two radiating crowns, the inner inclining towards the central column, the outer, which is longer, spreading flat upon the petals, and composed of innumerable threads, purple at bottom, but blue on the outside. On the top of the central column sits an oval germ, from whose base five awl-shaped stamens spread out horizontally, and these are terminated by oblong, broad, pendent anthers, which are easily moveable; from the side of the germ arise three slender, purplish styles, diverging, and ending in obtuse stigmas: the flower continues but one day, but there is a constant succession from July till autumnal frosts stop them. The germ swells to a large, oval fruit, of the size, shape, and colour of the Mogul Plum, inclosing a sweetish, but disagreeable pulp, in which the oblong seeds are lodged.

Incarnate or *trilobate Passion-flower*^y is a native of North America, and though the first species known among us, is not so common as the *Blue*. It differs from the former in having only three lobes to the leaves, which are serrate or toothed like a saw; the side lobes are sometimes divided into two narrow segments: the petals of the corol are white, with a double, purple fringe, star or glory: the fruit is as large as a middling apple, and when ripe is of a pale orange colour.

There is a sort, called *Granadilla*^z in the West-Indies, where the fruit is eaten. It has undivided, oblong leaves, hollowed next the petiole, which has two glands; the involucre is quite entire, as are also the leaves about the edge. The corol is large, with white petals, and a blue glory. The fruit is roundish, the size of a large apple, and yellow when ripe.

Another sort, called *Water Lemon*^a in the West-Indies, has an agreeable acid flavour in the pulp of the fruit, which quenches thirst, and is given there in fevers. It has undivided ovate leaves, quite entire about the edge; two-glanded petioles; and toothed involucre: the corol is white with brownish

^y *Passiflora incarnata* Lin. Mor. hist. f. 1. t. 1. f. 9.

^z *Passiflora maliformis* Lin. Plum. amer. t. 82.

^a *Passiflora laurifolia* Lin. Jacq. hort. 2. t. 162. amer. pict. t. 219.

red spots, and the glory or crown is violet : the fruit is of the size and shape of a pullet's egg, and when ripe is yellow. But since these, and much less the remaining species, may not readily fall under your cognizance, I restrain my desire of enlarging on so remarkable and beautiful a genus ; and pass on to a vulgar plant, which you will find in the last order, *Polyandria*, and with that I will close our examination of this class, and my prate for the present.

This is the common *Arum*, *Wake-Robin* or *Cuckow-pint*^b, called also vulgarly *Lords and Ladies*. Early in the spring it pushes up a one-leaved cowl-shaped spathe, under hedges and among bushes ; if you open this spathe, you discover a spadix, naked on the upper part, covered with germs at the bottom, and with anthers in the middle. This is distinguished from the other species, which are many, by having no stem but that which bears the fructification, hastate leaves that are quite entire, and the spadix club-shaped. Though it has the trivial name from the black spots upon the leaves, yet that is not a constant character, for oftentimes they are quite plain. As the plant advances the spathe opens, and discovers the club, varying from yellowish green to fine purple or red, these

^b *Arum maculatum* Lin. Curtis, Lond. II. 63. Ger.
834.

gradually

gradually decay, and leave a head of round red berries, which, as well as the rest of the plant, are very hot and biting. To this, with some others nearly allied to it, you would perhaps find it difficult to assign the proper class, unless from the strange and unusual appearance of the fructification, you were led to search for it in that now under consideration. These have not properly the stamens growing upon the style, but both are born upon a receptacle lengthened out in manner of a style, and performing the same office as the pistil in the other genera. Linnaeus observes that he might, and perhaps ought to, have ranged such plants under other classes; but he was deterred by the difficulty of assigning the number of stamens to each pistil. If he found any difficulty in removing them, you and I, dear cousin, will leave them quietly in the place which he has assigned them.

L E T T E R XXVIII.

May the 15th, 1777.

WE have hitherto, dear cousin, been conversant with such plants, as bear perfect or complete flowers only, except in the class *Syngenesia*, wherein we found imperfect, and even neuter floscules among the perfect ones. But in the twenty-first and twenty-second classes, which we are now to examine, you will never find any complete or perfect flowers; on the contrary, if they have stamens, there are no pistils, and if they have pistils, they are deficient in stamens. This is the common character of these two classes, and the only difference between them is, that in the class *Monoecia*, the staminiferous and pistilliferous flowers are found on the same individual plant; whereas in the class *Dioecia* they are always on distinct plants of the same species. It is scarcely necessary to add, that in both, the flowers which produce stamens, fall off without being followed by fruit or seed: and that the others, which have the germ, are fruitful.

The class *Monoecia*, which is the twenty-first in the system, has eleven orders, taking their titles and characters from the foregoing classes; eighty genera, and three hundred and seventy species.

The

The third order, *Triandria*, contains several genera nearly allied to the Grasses in habit, leaves, and placentation, or having only a single lobe to the seed: they differ however in the culm or straw not being hollow, but filled with a spongy substance; and in having no corol.

Since Haller thinks there is a natural connexion between the *Arum*, with which I finished my last letter, and the *Typha* or *Cat's-tail*, let us begin our examination with this. Having three stamens, it belongs of course to the order *Triandria*, and having the air of the Grasses, it ranges in the natural tribe of the *Calamariæ*, just mentioned. The flowers on both sides are born on a cylindric *Ament*; the staminate flowers surrounding the end of the stem; and those which have the pistils growing in the same manner below them, and very close set: there is no corol to either: the first have an obscure, three-leaved calyx; in the second it consists of pappous or villous hairs, and these have one seed, sitting on a capillary down or bristle: such are the generic characters. The greater, or broad-leaved *Cat's-tail*, otherwise called *Reed-mace*^c, is known by its sword-shaped leaves, and by having the two aments approximating. It is a large plant, being about six feet in height, with leaves three feet long

^c *Typha latifolia* Lin. Curtis, Lond. III. 61. Ger. 46.

and more, but not an inch wide; it is common in the water, on the banks of rivers, but especially in meats, ponds and marshes. There is a smaller species^d, not so common, which has semicylindric leaves, and the two aments remote from each other; the stem of this is not above three feet high, and the leaves are much narrower, stiffer, and embrace the stem more.

Sparganium or *Bur-reed* approaches very near to *Typha*: but the flowers of each sort are collected into a head, or roundish ament, those which have stamens above, and those which have pistils below, on the same stem: neither have any corol; both have a three-leaved calyx; the pistilliferous flowers have a bifid stigma, and are followed by a single juiceless drupe, containing one seed. *Erect* or *greater Bur-reed*^e is common in the same situations with *Typha*, and few plants exhibit more plainly the character of the class *Monocotyledon*. The stem is erect, and about three feet high; the leaves are erect and three-sided, but the upper ones flat: the stalk is generally branching.

Mays, otherwise called *Indian* or *Turkey Corn*^f, is of the same tribe. The stami-

^d *Typha angustifolia* Lin. Curtis, Lond. III. 62. Mor. hist. f. 8. t. 13. f. 2.

^e *Sparganium erectum* Lin.—*ramosum* Hudf. Mor. t. 13. f. 1, 3. Ger. 45. f. 1, 2.

^f *Zea Mays* Lin.

neous flowers are born in loose spikes: their calyx is a two-flowered awnless glume; neither has the corol any awn. The other flowers, which have one pistil only, are in very close spikes, below the former, and are inclosed with leaves. The glume both of calyx and corol is bivalved: the style is filiform, very long, and pendulous: one seed follows each flower: the receptacle is oblong and hollowed, so that the seeds are immersed half way into it, forming a very dense spike. The West Indian Mays has a stalk ten or twelve feet high; long, broad leaves; and spikes from nine inches to a foot in length, formed of golden grains. That which is cultivated in Italy, Spain, and Portugal, has more slender stalks, not more than six or seven feet high; the leaves narrower; the spikes shorter and more slender, with white grains. The North American Mays, which is the same with what is cultivated in Germany, does not rise more than four feet in height; the leaves are still shorter and narrower; the spikes not more than four or five inches long, with yellow and white grains mixed: the colour of these however varies; and indeed the three distinctions are but varieties arising from soil and climate.

Carex or *Sedge* is a most numerous genus of the same order, and the same natural tribe. The flowers of both sorts are born on an ament or catkin, and each flower has a one-leaved

leafed calyx, and no corol: the pistilliferous flowers, which are generally in distinct aments below the others, have an inflated, three-toothed nectary, three stigmas, and a three-sided seed inclosed within the nectary. Some few species have only one spike; many have several spikes, with both sorts of flowers in each; but more have the staminiferous and pistilliferous flowers in distinct spikes. These plants grow chiefly in marshes, bogs, ditches, wet woods, and the banks of brooks and rivers; they are the grass and fodder of fenny countries, and low swampy grounds.

In this class, *Monoecia*, as well as in the next, you will find many trees. In the order *Tetrandria*—Birch, Alder, Box, Mulberry; in that of *Polyandria*—Oak, Cork, Evergreen Oak, Walnut, Hickery, Chesnut, Beech, Hornbeam, Hazel, Plane;—and lastly in that of *Monadelphica*—all the species of Fir and Pine, Cedar, Larch, Arbor Vitæ, Cypress.

Alder is of the same genus with *Birch*: their common character is, that the flowers of both sorts grow in aments or catkins, each separate from the other; that the calyx is one-leafed and trifid; that each calyx in the staminiferous ament includes three flow-

* *Carex pendula* Curtis III. 63, *riparia* IV. 60, *acuta* 61, *gracilis* 62.—*dioica* Fl. dan. 166, *capitata* 379, *arenaria* 425, *vulpina* 308, *muricata* 284, *remota* 370, *carnescens* 285, *limosa* 646, *capillaris* 168, *panicca* 261, *vesicaria* 647, *hirta* 379.

ers, that have four-parted corols: in the pistilliferous aments there are only two flowers in each calyx, without any corol; but these are followed by seeds winged with a membrane on both sides, whereas the others drop from the tree, without leaving any mark behind them. In examining these, and the flowers in general of this and the following class, I must once for all inform you, that since many of them are close set together in the same ament, you must carefully separate one flower from the rest, to avoid confusion. You must also look for them very early in the spring, since most of the forest and timber trees flower before the leaf-buds expand.

Common Birch^h has ovate leaves, drawn to a very narrow point at the end, and serrated, or sharply toothed round the edge. Linnæus distinguishes the *Alder*ⁱ by its branching peduncles: the seeds also are born on a roundish *strobilus*, rather than an ament; and the leaves are roundish, crenated or obtusely notched round the edge; they are of a dark green, with very prominent nerves underneath, and little spongy substances where they divide: the bark of the Alder is black, whereas that of Birch is white.

In *Box* both sorts of flowers come forth

^h *Betula alba* Lin. Blackw. t. 240. Duham. t. 39. Ger. 1478. Evelyn's sylvia by Hunter.

ⁱ *Betula Alnus* Lin. Duham. t. 15. Ger. 1477. Evelyn's sylvia by Hunter.

together

is a native of China. Of another species^a, paper is made in Japan, from the bark; this has palmate leaves, and hispid fruit. *Fustick wood*^o is also from a species of Mulberry; this has axillary thorns, and the leaves are oblong and more extended on one side than the other. This grows in the islands of the West Indies, but in greatest plenty at Campeachy: the wood is imported into Europe from both places for the use of the dyers, but the tree is too tender to support our climate.

In the order *Polyandria* the *Oak* leads the way. The staminiferous flowers hang on a loose ament or catkin, whilst the pistilliferous ones are sessile in a bud: the calyx of the former is mostly quinquefid, and the stamens are from five to ten in number: in the latter the calyx is one-leaved and quite entire, and there is one style, split into five parts; but sometimes only into two, three or four. The fruit, or acorn, is well known: it is an oval nut, covered with a tough shell, and immersed at bottom into the calyx or cup.

We have two principal sorts, or perhaps rather varieties^p in England: one with the

^a *Morus papyrifera* Lin. Seba mus. 1. t. 28. f. 3. Kæmpf. amæn. t. 472.

^o *Morus tinctoria* Lin. Sloan. jam. 2. t. 158. f. 1.

^p Linnæus makes them one, under the title of *Quercus Robur*, and describes the species as having deciduous leaves, of an oblong form, but broader towards the upper part; the sinuses acute, and the angles obtuse. Duham. t. 46—48. Evelyn's Sylvaby Hunter. Ger. 1339.

leaves on longer petioles, and the acorns sessile, or on very short peduncles; the other, having the leaves not so deeply, but more regularly sinuate, the sinuses being opposite; they have scarcely any petioles: on the contrary the acorns grow on very long peduncles, are larger, and come out fewer together. There are some other variations in this noble tree, which being less considerable, do not attract our notice as botanists. Several species different from ours are found in North America; and some in the southern countries of Europe.

Ilex or *Evergreen Oak*^a has oblong-ovate leaves, of a lucid green above, but hoary underneath, standing on long petioles, and continuing all the year; they vary much, some being quite entire, long and narrow; others broad, with the edges toothed and set with prickles, almost like those of the Holly: the acorns are of the same shape with those of the Oak, but smaller. The *grain-bearing Ilex*^b, which yields the *kermes* or scarlet grain, has ovate leaves toothed on the edge, and the indentures armed with prickles as in the Holly; they are smooth on both sides: this is of so small a growth, that it may be looked upon rather as a shrub than a tree. The *Cork-tree*^c

^a *Quercus Ilex* Lin.

^b *Quercus coccifera* Lin.

^c *Quercus Suber* Lin.

is a sort of *Ilex*, with a chinky fungous bark, which is the principal as well as most obvious difference: in the air, and form of the leaves, it much resembles the Evergreen Oak: the leaves however fall off in May, before the young ones come out, so that the Cork trees are bare for a short time; which is not the case with the common *Ilex*. Most of the trees in this genus are much resorted to by insects, many of which form different sorts of galls: but here we are stepping out of our province, and will return to it again, by taking the *Walnut* under consideration.

This genus has the stamiferous flowers thick set in oblong, cylindric catkins, under the lower leaves of the branches; they consist of scales with one flower to each; the corol is six-parted and the stamens are usually eighteen, but vary in number from twelve to twenty-four. The pistilliferous flowers come out close to the branches, above the others, at the base of a petiole, generally in pairs: these have a quadrifid calyx, crowning the germ; a four-parted corol; and two styles: the fruit is a *drupe* containing a nut, with a furrowed shell, within which is a four-lobed, irregularly furrowed nucleus. *Common Walnut* ^t is distinguished by having the component leaves oval, smooth, sometimes a little toothed, and almost equal: there are many varieties in the

^t *Juglans regia* *Lin.* *Mill.* illustr:

fruit,

fruit, and several distinct species in North America, one of which is the *Hickery*^u. All the species have pinnate leaves, with a different number of lobes; ours has from five to nine, and the odd lobe is rather the largest. *Hickery* has seven lance-shaped lobes, toothed on the edge, and the odd one sessile.

Linnaeus joins the *Chestnut* and *Beech* in one genus, with this character: that the stamiferous flowers, which are in catkins, have a quinquefid, bell-shaped calyx, and about twelve stamens: that the pistilliferous flowers, which are produced from buds on the same tree, have a four-toothed calyx, three styles, and a muricate, four-valved capsule, which before was the calyx, and contains two nuts. He observes that the stamiferous flowers in the chestnut are disposed on a cylindric ament, whereas those of the Beech are in a ball. The catkins indeed of the former are very long, and the knots of flowers have near ten in each, and are distant from each other: the stamens are from five to eighteen, and have short filaments: the pistilliferous flowers are at the base of these, and are succeeded by two or three fruits close together; their calyx has more frequently six segments than four; the fruit varies in the number of kernels and pistils, but the most common number is six; and the kernels are convex on one side and

* *Juglans alba* Lin. Catesb. car. 1. 38.

flat on the other. The catkins of the Beech are roundish and loose, with few flowers; the stamens are eight in number, on long filaments: there are only two pistilliferous flowers together, and each of these is succeeded by a roundish nut, containing three or four hard three-sided nuclei or kernels, which are commonly called *Beech mast*. The specific difference which Linnæus assigns to the *Chestnut*^v and the *Beech*^w, is taken from the leaves; which in the first are lance-shaped, sawed with the teeth ending in points, and naked or smooth on the under surface; in the second, ovate and obscurely toothed, or rather waving on the edge.

In the *Hornbeam* both sorts of flowers are disposed in catkins: both have a calyx consisting of one ciliate or fringed scale, and no corol: the one has from eight to fourteen or sixteen stamens; the other has two germs, with two styles to each, and at the base of each scale of the ament or *strobilus* lies a seed, which is an ovate nut. In the *common Hornbeam*^x the scales of the *strobiles* are flat; and in the *Hop-Hornbeam*^y they are inflated: such

^v *Fagus Castanea* Lin. Mill. fig. pl. 84. Evel. sylva by Hunter. Ger. 1442.

^w *Fagus sylvatica* Lin. Evel. sylva by Hunter. Ger. 1444.

^x *Carpinus Betulus* Lin. Evel. Duh. t. 49. Ger. 1479.

^y *Carpinus Ostrya* Lin. Mich. gen. t. 104. f. 1, 2.

is the specific difference of these, which are the only known species. The leaves are wrinkled, marked with strong nerves, of an ovate form, and sharply toothed about the edge.

Hazel has the staminiferous flowers on a long cylindric catkin, with one flower to each scale, which is trifid; it has from six to ten stamens; generally eight: the pistilliferous flowers are remote from the others, sessile and inclosed in a bud; the calyx is two-leaved and torn: each flower has two very long, red styles; but you must observe that there are several flowers in the same bud, which you must therefore separate for examination: the fruit, as you know, is an ovate nut. As usual, neither of the flowers have any corol. The *common Hazel nut*, and *Filbert*² are supposed not to be specifically different, and the species is characterized by the stipules, which are ovate, and end obtusely; whereas those of the *Byzantine* or *Spanish nut*³, which Linnæus gives as a distinct species, are linear, and end acutely. These do not arrive at the dignity of trees, but are only shrubs.

The last tree I shall point out to you of this order is the *Plane*; which has the flowers of both sorts in globular aments: the

² *Corylus Avellana* Lin. Evel. sylva by Hunter. Duham. t. 77. Ger. 1438.

³ *Corylus Columna* Lin. Seba mus. 1. t. 27. f. 2.

staminiferous flowers have a few very small scales for the calyxes, a corol scarcely apparent, and anthers surrounding the filament: the pistilliferous flowers have many very small scales to the calyx; many petals to the corol; subulate styles with recurved stigmas; and roundish seeds, terminated by a pointed style, and having a simple down adhering to their base. The two species of this tree, for there are no more, are well distinguished by their leaves, which in the *Eastern* or *Asiatic Plane*^b are palmate; and in the *Occidental* or *Virginian*^c, lobate. The first was introduced early to Rome, and was the favourite tree of the Romans at their villas. All these trees are included in a natural tribe, called *Amentaceæ* by Linnæus, and *Juliferæ* by Haller and others: their character is sufficiently obvious from their name, and what has been already said in delivering the characters of the genera.

There remains still a set of kindred trees, of the order *Monadelphica*, and of a natural tribe entitled *Coniferæ* or *Cone-bearing*. Of these the Pine genus is chief: its generic characters are, that the staminiferous flowers are disposed in racemes, having each of them a four-leaved calyx; no corol, but abundance of stamens terminated by naked anthers: the

^b *Platanus orientalis* Lin.

^c *Platanus occidentalis* Lin. Catesby car. 1. t. 56.

pistilliferous

pistilliferous flowers are on a cone; each scale or calyx has two flowers, without any corol; one pistil; and a nut furnished with a membranous wing.

The whole genus may be divided into the *Pines*, having two or more leaves from the same sheathing base, and the *Firs*, having the leaves quite distinct at the base. Of the first division, the most known among us is the *Scotch Pine*^d, or as it is vulgarly called *Scotch Fir*: this has two leaves in a sheath; and the primordial ones solitary and smooth. It is by no means peculiar to Scotland, but is found all through Denmark, Norway, and Sweden, in Swisserland, and most other parts of Europe, and even in the West Indies. The *Pineaster* or *wild Pine* of Italy, the south of France and Swisserland, resembles this, but the branches are wider distant, and more horizontal; the leaves are larger, thicker, and longer, grow straight, are of a darker green, and end obtusely; the cones are seven or eight inches long: the leaves of the *Scotch Pine* are broader, grayish, and twisted; the cones small, and of a light colour: the timber also is far preferable, yielding the best red or yellow deal. Linnæus, however, does not seem to have distinguished them. The *Stone Pine*^e has

^d *Pinus sylvestris* Lin. Mill. illustr. Evel. sylva by Hunter. Ger. 1356.

^e *Pinus Pinea* Lin.

also double leaves, and the primordial ones solitary, but fringed; they are of a glaucous hue: the cones are thick, roundish, and end obtusely; the scales are flat, and the nuts so large, that in the south of France and Italy they think it worth while to break them, and serve the kernels up in deserts. *Frankincense Pine*^f has three leaves coming out of the same sheath, and cones as large as those of the Stone Pine, but more pointed, and with looser scales, that open horizontally, and drop the seeds. The *Cembra Pine*^g has five leaves in a sheath; they are smooth, of a light green, long, and narrow; the cones are about three inches long, with close scales, and large seeds easily broken. *Weymouth Pine*^h has also five leaves in every sheath, long and slender, but rugged on the edge; this tree grows remarkably straight and tall, and the bark is very smooth. In North America it is called *White Pine*, and is excellent for masts. The leaves of all these are linear and persistent; Linnæus calls this sort of leaf *aceroſe*.

Linnæus includes the *Cedar of Lebanon*ⁱ and *Larch*^k in this genus; others separate

^f *Pinus Tæda* *Lin.*

^g *Pinus Cembra* *Lin.* Gmel. fib. 1. t. 39. Duham. 2.

t. 32.

^h *Pinus Strobus* *Lin.*

ⁱ *Pinus Cedrus* *Lin.* Trew Ehr. t. 1. Edw. av. t. 188.

^k *Pinus Larix* *Lin.* Hort. angl. 11.

them,

them, because the leaves are fasciculate, or come out in clusters, spreading at top like a painter's brush: this circumstance Linnæus gives for the specific distinction, adding, that in the former they are acute, and in the latter obtuse at the end; this is the only difference he mentions; the leaves of the Larch however are deciduous, those of the Cedar permanent or evergreen: the character also of these two trees is totally different—the latter spreading its vast arms horizontally till the ends hang down with their own weight, and having a fastigate or flat top—the former having the branches decreasing from the bottom upwards, and being therefore nearly pyramidal,

Of the *Firs* properly so called, the *Pitch-tree*, or *Norway Fir*¹, and the *Spruce*^m, are the most common. The first has the leaves emarginate, or notched at the end: this is the tree from whence pitch is commonly extracted, and the wood of it is what we call white deal. The Spruce has awl-shaped, pointed, smooth leaves, turned two different ways; the timber of this resembles the other, and, when cut into boards, is called by the same name. *Silver Fir* is so named from the whiteness of the leaves underneath; they are emarginate, and in shape

¹ Pinus Picea Lin. Ger. 1363.

^m Pinus Abies Lin. Ger. 1354.

much resembles those of the Yew: a great deal of turpentine is made from this. *Balm of Gilead Fir*ⁿ has the leaves subemarginate, or but little notched at the end; they are dotted in a double line underneath. There are many varieties, especially of the Spruce; but it would lead us too far to notice them.

I shall finish this knot of trees with the upright, the funereal *Cypress*, which has its stamiferous flowers collected into an ovate ament, with one-flowered scales, and four sessile anthers without filaments to each flower: the pistilliferous flowers are in a roundish cone, eight or ten in number, one to each scale; these have many truncated points, hollow at the top, which are perhaps the styles; under the scales of the cone lies an angled nut. *Common upright Cypress*^o has imbricate leaves, with the leafing branches quadrangular: this takes naturally a close pyramidal form, and when large has the finest effect imaginable near buildings. *Spreading Cypress* is only a variety of this, but grows to a very large size, and furnishes the wood so famous for its durability, and resistance to insects. *Deciduous Cypress*^p has the leaves in two ranks,

ⁿ Pinus Balfamea Lin. Pluk. alm. 2. t. 121. f. 1.

^o Cupressus sempervirens Lin.

^p Cupressus disticha Lin. Cat. car. 1. t. 11.

and

and spreading: it is a native of America, and grows to a vast size. But it is time to descend from trees to herbs, and thus put an end to this long letter.

The *stinging Nettles*^a are to be found in the order *Tetrandria* of this class; but such vulgar ill-humoured plants may forgive your passing them by, where you have so many interesting and even great personages to attract your notice.

The immortal *Amaranth* however, having superior elegance and beauty to boast, will not thus be passed unnoticed. It is of the order *Pentandria*, and having no corol, is ranged by some in the natural tribe of apetalous flowers. The same raceme or bunch bears incomplete flowers of both kinds, each of them having a three or five-leaved calyx; the one bearing three or five stamens, the other three styles, and a one-celled capsule opening horizontally, with one seed only lodged in it. The species are numerous: one of the most known is the *Amaranthus tricolor*, cultivated for the beauty of its leaves, which are variegated with green, yellow, and red: this is one of those that have three stamens to the flowers, which grow in roundish heads, are axillary, and surround the stem; the leaves are broad lance-shaped. *Ama-*

^a *Urtica Lin.*

ranthus bicolor^r has only two colours in the leaves, an obscure purple and bright crimson: this resembles the other, but has lance-shaped pointed leaves. *Prince's Feather*^s has five stamens to the flowers, which are produced in decomposed, cylindric, long, pendulous racemes, of a bright purple, and two feet or more in length. *Tree Amaranth* resembles this, but is seven or eight feet high: the racemes are thicker, but not so long. *Bloody Amaranth*^t has also five stamens: the racemes are compound and erect, the side ones very spreading; the leaves are ovate-oblong: this has purple stalks and leaves; the racemes are short, and at the end of the stem there is a large cluster of them placed crosswise, with one upright in the middle: the flowers are bright purple at first, but grow darker. Thus I have selected the most specious of this fine genus for your examination: your gardener will furnish you with them from the hot-beds, when he raises his annual flowers.

From the order *Polyandria*, I shall present you with two wild herbs—*Arrow-head* and *Burnet*. The first has many staminiferous flowers, and a few with pistils immediately below them: both have a three-leaved

^r *Amaranthus melancholicus* Lin.

^s *Amaranthus caudatus* Lin.

^t *Amaranthus sanguineus* Lin. Mill. fig. 22.—*cruentus* Mart. cent. t. 6.

calyx, and a corol of three petals: the one has about twenty-four stamens; the other many germs in a head, ending in very short styles, terminated by acute permanent stigmas. Our *common Arrow-head*^u is easily distinguished by its leaves shaped like the head of an arrow, and pointed: it grows in the water, has rounded white petals with purple tails, and bears an evident affinity to *Water-plantain*.

Burnet has incomplete flowers of both sorts in the same spike; those with stamens below the others: they have a four-leaved calyx, and a four-parted corol: the lower ones have from thirty to forty stamens; the upper, two pistils, and a kind of berry formed from the tube of the corol hardened. *Common or smaller Burnet*^v is distinguished from the other species, by being unarmed or having no thorns; and the stems being rather angulate. This and the *Great Burnet*^w, though separated so widely in the artificial system, are evidently of the same natural genus: the calyx of the latter is two-leaved, and the number of stamens only four, and one pistil; both in the same flower: it is also a much larger plant, with not so

^u *Sagittaria sagittifolia* Lin. Fl. dan. 172. Ger. 416.

^v *Potierium sanguisorba* Lin. Curtis, Lond. II. 64. Ger. 1045.

^w *Sanguisorba officinalis* Lin. Fl. dan. 97. Mor. hist. f. 8. t. 18. f. 7. Ger. 1045.

many pairs of lobes to the leaves: this grows in moist meadows; the other in dry, especially chalky pastures.

Ricinus, or *Palma Christi*, ranges in the order *Monadelphica*. The flowers have no corol: some are furnished with many stamens, and these have a five-parted calyx; others have three bifid styles, with a three-celled capsule, containing one seed in each cell; in these the calyx is three-parted. *Common Palma Christi** has peltate, palmate leaves, toothed about the edge, of a glaucous hue underneath, and glands on the petioles. In the West Indies there are several others, varying from this, and from each other; which are not, however, generally supposed to be distinct species. They call them *Agnus castus*, or *Oil-tree*, and extract from them an oil for their lamps; this is the *Castor Oil*, used in medicine. The common sort grows in Sicily, and the other warm parts of Europe.

The order *Syngenesia* of this class contains a set of plants that belong evidently to the same natural tribe, entitled *Cucurbitaceæ*, or *Gourd-plants*. They all agree in a one-leafed calyx, divided into five segments; a superior, monopetalous corol, divided also usually into five; three filaments; one style, generally trifid; and a *pomum* for a fruit.

* *Ricinus communis* Lin. Mill. fig. 219.

Momordica is distinguished principally by the elastic bursting of the fruit, which in the common sort is hispid; the stalks of this have no tendrils. From the property of throwing out the seeds with the juice, this plant has acquired the name of *Spirting Cucumber*^y.

Gourd has the seeds of the fruit with a tumid margin. *Long Gourd*^z has the leaves slightly angulate, downy, two-glanded underneath at the base; the flowers white, on long peduncles, and reflexed at the brim; the fruit crooked, yellow when ripe, and the rind hard and woody, so that it will contain liquids; whence it is called *Bottle Gourd*.

Pompion, corruptly called *Pumpkin*^a, is of this genus, and has lobate leaves, with smooth fruits, which will grow to the size of a peck.

The *Squash*^b which is another species, has also lobate leaves, erect stems, and the fruit flatted and knotty.

Warted Gourd^c has likewise lobate leaves, and knobby fruits, covered with warts. These differ much in their form and size.

But the most known and cultivated of these fruits are the *Melon* and *Cucumber*, which belong to another genus, called *Cu-*

^y *Momordica Elaterium* *Lin.*

^z *Cucurbita lagenaria* *Lin.* *Mor. hist. f. 1. t. 5. f. 3.*

^a *Cucurbita Pepo* *Lin.*

^b *Cucurbita Melopepo* *Lin.*

^c *Cucurbita verrucosa* *Lin.*

cumis, having the seeds of the fruit sharp. *Melon*^d has the angles of the leaves rounded, and the fruits covered with little swellings: it varies much, as you know, in the form of the fruit. *Cucumber*^e has the angles of the leaves sharp, and the fruits oblong and rugged. All these having large flowers, with the parts very distinct, are proper to give you a just idea of this class; with these then I will finish, and release you for the present.

^d *Cucumis Melo Lin.*

^e *Cucumis sativus Lix.*

L E T T E R XXIX.

June the 1st, 1777.

THE twenty-second class differs no otherwise from the preceding, than in the disposition of the incomplete flowers, namely on different individuals of the same species; this is its essential character, and this gave occasion to its name—*Dioecia*. There being no difficulty then in understanding this, which indeed has been repeated several times before, let us go on without farther preface to the examination of such plants as are most likely to fall in our way^f.

Such is the *Willow*, which is of the second order—*Diandria*. Both stamiferous and pistilliferous flowers are produced in aments or catkins, on different trees; so that you will have double trouble in examining the flowers of this class; for when you have found one sort, you will have to look about, and perhaps have some difficulty in finding the other. In so delightful a study however, you will not grudge a little pains, after havnig already taken so much. The flowers of Wil-

^f The genera in this class are fifty-five, and the species two hundred and nineteen.

low have no corol, and their calyx is nothing but the scales of the ament; there is a little honied gland in the centre of each stamiferous flower: you will easily know the other aments, by the ovate germ in each little flower, gradually lessening to a pair of styles, scarcely distinguishable from it, but by the two erect, bifid stigmas, with which they are terminated; this germ becomes a one-celled, two-valved capsule, containing many small seeds, crowned with a rough simple down. There are anomalies in this genus; for one species has three, another five stamens, and a third has complete flowers. From more than thirty species I shall select the *White Willow*^e, which is a tree so common in watery situations: you will know it by the lance-shaped, acuminate leaves, toothed about the edges, pubescent, or villous, on both surfaces, and having the lower ferratures glandulous: the leaves are very white underneath; and the catkins are short and thick: it will grow to be a large tree, when it is not headed. Several species are commonly cultivated in Osier-holts^h, but being always kept down, in order to have a constant succession of long, slender twigs, you will have little opportunity of examining their fructification.

^e *Salix alba* Lin. Blackw. t. 327. Ger. 1389.

^h *Salix vitellina*, *amygdalina*, *purpurea*, *viminalis*, &c.
Lin.

But one species being cultivated for its beauty, which fortunately depends upon the natural growth, you may study it at your leisure: this is the *Weeping Willow*ⁱ, known at first sight by its long, slender, pendulous branches; the leaves are smooth, narrow, and linear, tending to lance-shaped. *Common Sallow*^k has ovate leaves, wrinkled on the surface, which is villous above, and tomentose or nappy underneath, and slightly toothed or waved on the edges. There are several varieties of this vulgar species.

Mistletoe is of the order *Tetrandria*, its parasitic quality you are well acquainted with, and that alone makes it generally obvious to every body: it is however no part of its character. The genus is determined by a four-parted calyx, and an anther growing to each part, without a filament, in the stamiferous flowers; a four-leaved calyx sitting on the germ; no style; and a berry inclosing one heart-shaped seed in the others; neither have any corol. *Common or White Mistletoe*^l is distinguished from the rest of the species by lance-shaped leaves ending obtusely, a dichotomous stalk, and axillary spikes of flowers.

ⁱ *Salix babylonica* *Liq.*

^k *Salix caprea* *Lin.* Fl. dan. 245. Ger. 1319.

^l *Viscum album* *Lin.* Mill. illustr. Duham. t. 104. Ger. 1350.

In the next order *Pentandria*, we have Spinach, Hemp, and Hop. The first has a five-parted calyx in the stamiferous flowers, and a quadrifid or four-cleft one in the others; these have four-cleft styles, and one seed within the indurated calyx. Linnæus separates the *garden*^m sort from the *Siberian*ⁿ, by the seeds being sessile, which in the latter are peduncled: of the former are several varieties: two remarkable ones, which perhaps may be distinct, the one having sagittate leaves, and prickly seeds; the other rather ovate leaves, with smooth seeds.

Hemp^o has a five-parted calyx in the flowers which bear stamens, but in the pistilliferous ones it is one-leaved, entire, and gaping on the side: these have two styles, and the seed is a bivalve nut within the closed calyx. There is only one known species, and therefore until others are discovered, there is no occasion for any specific distinction.

Hop^p has a five-leaved calyx in the stamiferous flowers; in the others it is one-leaved, obliquely expanding, and entire; these have two styles, and one seed within a

^m *Spinacia oleracea* Lin.

ⁿ *Spinacia fera* Lin.

• *Cannabis sativa* Lin. Mill. fig. pl. 77.

^p *Humulus Lupulus* Lin. Mill. illustr. Ger. 885.

leafy calyx: many of them are collected together to form what we call the Hop. In the three last genera the flowers have no corol.

The order *Hexandria* has the *Tamus* or *black Bryony*, the flowers of which have a six-parted calyx and no corol; the pistilliferous flowers have a trifid style, and a three-celled berry below the flower, containing two seeds: our common species^a has heart-shaped undivided leaves.

The *Poplars* are in the order *Oëstandia*. The flowers of both sorts are here born on similar aments, consisting of scales torn on the edge, and each having one flower, without any petals, but a top-shaped nectary ending obliquely above in an ovate border; the pistilliferous flowers have a quadrifid stigma, and are succeeded by a two-celled capsule, containing many downy seeds. *White Poplar*^r has roundish leaves indented on the edges into angles, and downy underneath. *Great White Poplar* or *Abele-tree*, is a variety of this, with larger leaves, more divided, and of a darker green. *Trembling Poplar* or *Asp*^s has leaves like the former in shape, but smooth on both sides; these being set on long petioles that are flatted at the tip, trem-

^a *Tamus communis* Lin. Mill. illustr. Mor. hist. f. 1. t. 1. f. 6. Ger. 871.

^r *Populus alba* Lin. Evel. sylva by Hunter. Duham. t. 36. Ger. 1486, and 1487.

^s *Populus tremula* Lin. Ger. 1487.

ble with the slightest breeze. *Black Poplar*^t has rhomboid leaves, pointed and toothed; they are smooth on both sides, of a light green; and the catkins are shorter than those of the two former. *Carolina Poplar*^u has very large heart-shaped leaves, obtusely notched about the edges; and the shoots angled. *Tacamahaca*^v is a species of Poplar, with oblong-ovate leaves, toothed about the edges, white underneath, with a scarcely visible down, and the veins forming a fine net-work: the stipules are remarkably resinous.

Of the order *Enneandria* there is an herb, frequent under hedges and in woods, called *Dog's Mercury*^w: the flowers have a three-parted calyx, and no corol; in some there are nine or twelve stamens, with globular, twin anthers; in others, on a distinct plant, two styles, and a two-grained, two-celled capsule, containing one seed in each cell. The species here meant is distinguished from the rest by its very simple unbranched stem, and its rough leaves.

In the order *Monadelphica* you will find a genus of trees under the title of *Juniper*, in-

^t *Populus nigra* Lin. Mill. illustr. Ger. 1486.

^u *Populus balsamifera* Miller. angulata.

^v *Populus balsamifera* Lin. Cat. car. 1. 34. Duh. arb. 2. t. 38. f. 6.

^w *Mercurialis perennis* Lin. Curtis, Lond. II, 65. Ger. 333.

cluding

cluding not only the Juniper properly so called, which is rather a shrub than a tree, but also the Savin, and American or Sweet Cedars, &c. The staminiferous flowers in this genus are born on an ament, the scales of which form the calyx of each flower, having no corol but only three stamens: the pistilliferous flowers have a small, permanent, three-parted calyx, growing to the germ, which is below the flower; they have a corol of three petals, three styles, and a three-seeded berry, with three tubercles of the unequal calyx on the lower part, and three little teeth at top from the remains of the petals. *Common Juniper*^x has three spreading, pointed leaves, coming out together, that are longer than the berry. *Savin*^y has opposite, erect, decurrent leaves, with the oppositions boxed or running over each other along the branches, they are short and acute: this shrub spreads out much horizontally, rising little in height. There are several species of *Cedar* natives of America. *Bermudas Cedar*^z is that which is imported for casing black lead in pencils, was formerly used for wainscoting rooms, and now for ships in the West Indies, the worms not attacking this kind of wood. The specific dis-

^x *Juniperus communis* Lin. Mill. illustr. Duham. t. 127. Ger. 1372.

^y *Juniperus Sabina* Lin.

^z *Juniperus bermudiana* Lin. Herm. lugdb. t. 347.

inction is from the leaves; the lower ones being threefold, the upper twofold^a, decurrent, subulate, spreading, and acute. The plantations have also the *Red Virginia*^b, *Carolina*, and *Barbadoes*^c Cedars; and there are others which are natives of the southern parts of Europe^d.

The baleful *Yew*^e is of the same order: the flowers have no corol, nor, properly speaking, any calyx, unless we allow the three or four-leaved bud to be such: on some trees they will be found to have many stamens, terminated by peltate, eight-cleft anthers; on others, to have an ovate, pointed germ, ending in an obtuse stigma without any style, the germ becoming a kind of berry, or rather succulent receptacle, with one seed in it, having the top naked: these flowers all come out from the *axæ* of the leaves, which are linear, end in a sharp point, and are ranged in a double row close together along the mid-rib; the berry is red, and mawkishly sweet—not poisonous, though the leaves certainly are so.

I will now finish our examination of this class, and close this letter, with the singular

^a Miller says fourfold and imbricate.

^b *Juniperus virginiana* Lin. Sloan. jam. 2. t. 157. f. 3.

^c *Juniperus barbadensis* Lin. Pluk. alm. 197. 4. Hort. angl. t. 1. f. 1.

^d *Juniperus thurifera*, *phoenicia*, *lycina*, *Oxycedrus* Lin.

^e *Taxus baccata* Lin. Evel. sylva by Hunter. Duham. t. 86. Ger. 1379.

genus of *Ruscus*, the flowers of which have a six-leaved calyx, no corol, but an ovate inflated nectary, perforated at top, in the centre of the flower: the staminiferous flowers have no filaments, but only three anthers, sitting on the top of the nectary, and united at the base, whence this genus is of the order *Syngenesia*: the pistilliferous flowers have one style, and a germ hid within the nectary, which becomes a globose, three-celled berry, containing two globose seeds. The common species, which we call *Butcher's-broom*, or *Knee Holly*^f, bears its flowers in the middle of the leaves, on their upper surface; these are of the shape and size of myrtle leaves, but stiffer, and end in prickly points; the berries are red, and almost as large as cherries: in another species^g the flowers are produced on the under surface of the leaves: in a third^h they are produced also underneath, but are protected by a leaflet, whereas in the other species they are naked: a fourthⁱ flowers from the margin of the leaves: and the *Alexandrian Laurel*^k, which is a species of *Ruscus*, from long racemes at the ends

^f *Ruscus aculeatus* *Lin.* Mill. illustr. Duham. t. 59. Ger. 907.

^g *Ruscus Hypophyllum* *Lin.* Col. ecphr. 1. t. 165. f. 1.

^h *Ruscus Hypoglossum* *Lin.* Col. t. 165. f. 2.

ⁱ *Ruscus androgynus* *Lin.* Dill. elth. t. 250. f. 332.

^k *Ruscus racemosus* *Lin.* Mor. hist. f. 13. t. 5. f. 14.

of the branches; the flowers of this are complete, and therefore the plant ought not to be found in this class, but since it is evidently of this genus naturally, Linnæus has left it with its own family, choosing rather to violate the laws of his own arbitrary system than those of nature. The stalks of this are slender and pliable; the leaves are rounded at the base, but end in acute points, they are smooth, and of a very lucid green; the flowers are of an herbaceous yellow colour, and are succeeded by berries like those of our Butcher's-broom, but smaller. With this beautiful evergreen I leave you, dear cousin, till the next letter.

L E T T E R X X X .

June the 14th, 1777.

THERE are some persons, dear cousin, who think the twenty-third class — *Polygamia*, might have been spared, and the plants comprised in it¹ ranged in the other classes, according to the number, situation, proportion, &c. of the stamens. But let us take things as we find them, without inquiring too deeply into the merits, of what, after all, is of no great importance. The essence of this class consists in having complete flowers, accompanied by one or both sorts of incomplete ones, either on the same or different individuals. The latter circumstance furnishes the character of the three orders.

The first order of this class having the complete and incomplete flowers always on the same plant, is hence entitled *Monoecia*. You may perhaps remember, that some of the grasses were said to be of this-order^m; here also are the *Plantain-tree* and *Banana*ⁿ; *Valantia* or *Crosswort*, which you may find in hedges and bushy places, and will evidently

¹ Genera 34, species 224.^m See letter XIII.ⁿ *Musa paradisiaca* & *sapientum* Lin. Trew. Ehr.
t. 18—23.

perceive

perceive to be of a natural tribe^o you have met with before : there is usually one complete flower in this genus, accompanied on each side with an incomplete staminiferous one ; the former has the corol four-parted, four stamens, a bifid style, and one seed ; the latter have the corol trifid in some species, quadrifid in others ; three stamens in some, four in others, and an obscure pistil ; none of the flowers have any calyx : frequently these plants produce incomplete flowers only, and therefore no seed ; owing I presume to their running so much at the root. Our wild species^p is one of those which have the incomplete flowers quadrifid, and it has two leaves to each peduncle, which supports about eight flowers, with yellow corols ; there are four leaves to each whorl, and they, with the whole plant, are covered with soft hairs.

Pellitory of the Wall has two complete flowers, with one pistilliferous flower between them, within a six-leaved involucre ; they have a four-cleft calyx, no corol, one style, and one seed : the complete flowers are distinguished by having four stamens ; the other has none. Our common species^q has broad lance-shaped leaves, dichotomous

^o *Stellatæ* : see letter XV.

^p *Valantia Cruciata* *Lin.* Blackw. t. 76. Mor. hist. f. 9. t. 21. f. 1. Ger. 1123.

^q *Parietaria officinalis* *Lin.* Curtis, Lond. IV. 63. Ger. 331.

tomous or forked peduncles, and two-leaved calyxes: the pistilliferous flowers are quadrangular and pyramidal.

Atriplex or *Orache* has such affinity with *Chenopodium* or *Goosefoot*, that, as Linnaeus observes, if *Orache* had only complete flowers it would be a *Goosefoot*; and if this had pistilliferous flowers, it would be an *Orache*. Most of these are common weeds on dung-hills, or on the sea-coast.

Acer or *Maple* is a tree in which you may examine the character of the class, and order, at your ease. The flowers are produced in bunches; the lower ones complete, and those which are towards the end stamiferous: they have a quinquefid calyx, a corol of five petals; the complete flowers have besides all this one pistil, and two or three capsules, joined at the base, flat, each terminating in a large, membranaceous wing, and containing one seed. The *Great Maple*, commonly called *Sycamore*^r, has five-lobed leaves unequally ferrate, and the flowers in large racemes. *Common Maple*^s has lobed leaves, obtuse, and emarginate; generally they are divided half way into three lobes, the side ones obtusely semi-bifid, the middle one semi-trifid; the upper leaves rather cut

^r *Acer Pseudoplatanus* *Lin.* *Evel. sylva* by Hunter. *Duham. t. 9. Ger. 1484.*

^s *Acer campestre* *Lin.* *Ger. 1484.*

into five lobes: the bunches of flowers are smaller. This tree grows much in hedges.

The famous *Mimosa* or *Sensitive* belongs to this first order of the class Polygamia. The flowers have a five-toothed calyx, a five-cleft corol, and five or more stamens: the complete flowers have also one pistil, and a legume for a seed-vessel. This genus is very numerous, but all the species are not endued with the sensitive quality. That which is most common in the islands of the West Indies and our stoves^t, has the stems armed with short recurved spines; pinnate leaves composed of four or five pair of lobes, whose base join at a point where they are inserted into the petiole, spreading upwards like the fingers of the hand; the flowers come out from the *alæ* on short peduncles, in small globular heads, the corols are yellow; they are succeeded by short, flat, jointed pods, with two or three orbicular, bordered, compressed seeds in each. Some species move much more readily than others; some drop the lobes of the leaves only, and others drop the petioles of the whole leaf also. The *true Egyptian Acacia*^u, and many other Acacias, having the same characters, are included in this genus: they are too tender to flower much in our climate.

^t *Mimosa pudica* Lin. Comm. hort. 1. t. 29.

^u *Mimosa nilotica* Lin.

Three-thorned Acacia^v is of another genus, and indeed of another order — *Dioecia*: for it has the staminiferous flowers in a long, compact, cylindric ament, with some complete ones generally at the end of it; and on a distinct plant pistilliferous flowers on loose aments. The complete flowers have a quadrifid calyx, a four-petalled corol, six stamens, one pistil, and a legume: the staminiferous flowers have a three-leaved calyx, a corol of three petals, and six stamens: and the pistilliferous flowers have a five-leaved calyx, a five-petalled corol, one pistil, and a legume. The common species is distinguished from the other^w by its large thorns, which have generally two smaller ones, coming out from the side: they are axillary, and are often produced in clusters at the knots of the stem: the leaves are pinnate, and have ten pair of small lobes. In America, its native country, this tree is called *Honey Locust*.

The *Ash-tree* is also of this second order: having on some trees complete flowers, on others pistilliferous ones, each frequently accompanied by the others; they have either a four-parted calyx or none, a corol of four petals or none, and one pistil: the complete

^v *Gleditsia triacanthos* *Lin.* Duham. 1. t. 105. Hort. angl. t. 21.

^w *Gleditsia inermis* *Lin.* Mill. fig. pl. 5.

flowers have also two stamens, and one lance-shaped seed. *Common Ash*^x has pinnate leaves, with five pair of lobes, slightly serrate on the edge; the flowers have neither calyx nor corol, and are produced in loose bunches from the sides of the branches. *Flowering Ash*^y has the lobes of the leaf serrate; the flowers are furnished both with calyx and corol; and are in large loose bunches at the ends of the branches. The *American or Carolina Ash*^z has the lobes quite entire, and the petioles round.

Of the third order — *Triœcia*, we have the *Fig*, which though it bears flowers that are visible, yet conceals them within the fruit, and therefore may lead us well enough to the class *Cryptogamia*. What we call the fruit of the Fig Linnæus names the receptacle, or common calyx of the flowers; he describes it as being top-shaped, fleshy, converging, closed at the broad end with several scales, and having the inside covered with little flowers, complete and incomplete; sometimes in the same fruit, and sometimes on different trees: the staminiferous flowers have a three-parted calyx, and three stamens; the pistilliferous flowers have a five-

^x *Fraxinus excelsior* Lin. Evelyn's sylv. by Hunter. Duham. t. 101. Ger. 1472.

^y *Fraxinus Ornus* Lin. Mill. illustr. Hort. angl. t. 9.

^z *Fraxinus americana* Lin. Catesb. car. 1. 80.

parted calyx, one pistil, and one roundish, flattened seed; neither of them have any corol. Our *common* or *eatable Fig*^a is distinguished by its palmate leaves: the different fruits are but varieties arising from the same seed. The history and œconomy of this singular tree, as related by naturalists and travellers, will be an agreeable relaxation to you, amidst our dry botanical disquisitions.

• *Ficus Carica Lin.* Mill. illustr.

L E T T E R . XXXI.

June the 21st, 1777.

HAVING now gone through all the classes of conspicuous flowers, we should regularly proceed to the last class of the system, in which they are inconspicuous; but having kept on a straight course for a long time, we will now turn out of it, and take a view of the different appearances which the nectary puts on, in the several genera of plants wherein it is found.

Several of these have been cursorily mentioned as characters of the genus: and we have even hinted at the general use of the nectary^b: but we shall now go farther, and say, that though this part of the flower has not hitherto been observed in two hundred genera^c, yet that in all probability it exists in all, if not as a distinct visible part, as a gland or pore however, or a set of glands or pores, exuding that viscid, sweet juice, so useful secondarily for the nourishment of a great variety of insects, and, at the same time, doubtless primarily necessary to the fructification of the plant itself. For you will observe in monopetalous tubular corols,

^b See letters IV. and XVII.^c Besides the Grasses.

that

that though they have no visible nectary, yet there is a nectareous juice secreted into their tube^d, which is therefore probably provided with glands for this purpose, too minute to be seen with the naked eye, but which an accurate inspection with glasses might perhaps detect. Polypetalous flowers with open calyxes, having no tube, or basin for the reception of the nectareous juice, have in general a body destined to prepare and contain it, in order that it may be distributed to the surrounding parts of fructification, as it is wanted. In the compound and umbellate tribes of plants indeed no nectaries have been remarked, but then you remember, that the whole flower in both of them is so small, that it is no wonder if a part so minute as the nectary frequently is in larger flowers, should escape our observation in these: we may presume however that they abound in nectareous juice, since we observe that insects are particularly fond of these two tribes. No genus of the class Icosandria has any distinct nectary; but then the calyx is one-leafed, and forms a commodious basin for the reception of the nectareous juice, which is frequently very discernible in it. The verticillate tribe^e also is not mentioned by Linnæus as being fur-

^d As particularly in the Honeyfuckle and Aloe,

^e *Didynamia Gymnospermia* *Lin.*

nished with visible nectaries; nor are they perhaps immediately necessary here, because the corol is monopetalous, and the monophyllous calyx forms a persistent tube: many genera however of this order have a gland in the bottom of the calyx, surrounding the base of the germ; this is large in the *Bugle*, and sufficiently visible in the *Dead Nettle*.

No appearance of the nectary is more common than this of glands. You have already seen^f that they are considerable in several genera of the cruciform tribe; that they have furnished us with generic characters: and that they are even the cause of the classical character itself^g. It has been just mentioned that they are found in the verticillate or labiate tribe: and many genera, dispersed in various parts of the system, have this glandular nectary. Thus *Pluknetia* (1084)^h has four glands at the base of the filaments, as in the class *Tetradynamia*. *Cercis* (510) has a style-form gland under the germ. *Lathræa* (743) and *Orobanche* (779) have a gland at the base of the germ. *Cassyta* (505) has three glands; *Echites* (299) and *Tabernæmontana* (301) have five; *Hernandia* (1049)

^f Letter XXIII.

^g See letter II. IV. and V. compared with letter XXIII.

^h The figures refer to the number of the genus in Linæus's genera and systema.

has

has six or four, surrounding the germ; and *Griehum* (1235) has a set of oblong glands, round the germ, uniting into a little crown. *Malpighia* (572) has two glands, at the bottom and on the outside of each leaf of the calyx: in *Banisteria* (573) the case is the same, except that one foliole of the calyx has no glands, and therefore the whole number is eight; whereas in the other it is ten. *Reseda* (608) has a gland arising from the receptacle, between the stamens and the upper petal: and *Croton* (1083) has five of them, fixed to the receptacle. *Astronium* (1111) has five glands in the disk of the flower. *Cucurbita* (1091) or the gourd genus, has a single, triangular, concave gland in the centre of the flower: and in the *Salix* (1098) or *Willow* the situation is the same, but the form of it is cylindric.

Another very usual form of the nectary is scales, which are in truth but flattened glands. *Monnieria* (850), and *Vicia*, (873) or the Vetch genus, have one scale only, at the base of the germ. *Cuscuta* (170) or *Dodder*, has four scales, at the base of the stamens. But many have five scales: as *Parnassia* (384); at the base of the filaments in *Schrebera* (319), *Quassia* (529), and *Melastoma* (544); between the stamens in *Iresine* (1113); at the base of the germ, in *Crassula* (392) *Cotyledon* (578) and *Sedum* (579); surrounding the receptacle, in *Samyda* (543);

or at the base of the petals, in *Erythoxylon* (575) *Ranunculus* (699) *Grewia* (1026) and *Kiggelaria* (1128). *Amaryllis* (406) and *Leontice* (423) have six scales; without the base of the filaments in the first, and inserted into the base of the petals in the second.

Not unfrequently does the nectary appear in the shape of valves, which are generally five in number; in *Plumbago* (213) placed at the bottom of the corol, and inclosing the germ; surrounding the germ in *Achyranthes* (288); and covering the receptacle in *Campanula* (218) and *Roella* (219.) *Asphodel* (421) has six of these valves, inserted into the base of the corol, and forming a complete arch over the germ; a filament springing from each of them.

In *Erythronium* (414) there are two callous tubercles at the base of each inner petal; in the *Laurus* (503) genusⁱ, three tubercles round the germ; and two round glands, on a short stalk, near the base of each filament of the inner rank. In some species of *Iris* there are three dots^k at the base and on the outside of the corol; in *Tamus* (1119) an oblong dot grows to the inside of each division of the calyx; and in another genus, *Swertia* (321) are ten of these dots; two at the base of each division of the corol, surrounded

ⁱ See letter XIX.

^k Puncta,

with

with bristles. In the *Hyacinth*¹ (427) there are three pores at the top of the germ: and in both the genera of *Fritillaria* (411) and *Uvularia* (412) there is an excavation at the base of each petal: in the *Crown Imperial* this is considerable, and generally exhibits a large drop of nectareous juice. *Mercurialis* (1125)^m has two subulate *acumens* or sharp points, one on each side of the germ; and *Vallisneria* (1097) has a *cusps* on each petal.

You remember the beautiful appearance that the nectary made in some species of *Iris*ⁿ as a longitudinal villous line upon the petals: in the *Lily* (410) it is a pipe or tubulous line along the middle of each petal: and in *Frankenia* (445) it is a channel running along the tail.

In some genera the nectary takes the exact form of petals, and was always confounded with them, until Linnæus pointed out the difference: this is the case with several plants of the first class^o, and with *Lecythis* (664) in the thirteenth; in all these it is of one petal only: in *Galanthus* (401) or *Snowdrop* it consists of three parallel, notched, obtuse, petal-

¹ Our wild Hyacinth (*H. non scriptus*) has not these pores, or at least they are not visible to the naked eye.

^m Letter XXIX.

ⁿ Letter XIV.

^o Letter XI.

like leaflets, forming a cylinder about half the length of the corol. *Illicium* (611) has several awl-shaped folioles of the same length with the petals themselves. *Cardiospermum* (498) has a four-petalled nectary inclosing the germ; and in *Hartogia* (273) *Sauvagesia* (286) and *Helicteres* (1025) it is made up of five petals. *Andrachne* (1095) has five semi-bifid herbaceous folioles, less than the petals, and placed between them. All the *Grasses*, *Rice*, (448) and *Mays* (1042) agree in having a nectary of two minute, oblong leaflets. *Swietenia* (521), *Melia* (527), and *Meliantbus* (795) have a one-leafed nectary, with a many-toothed mouth in the two first, and in the last within the lowest division of the calyx, to which it grows. In *Musa* (1141) also, the nectary is one boat-shaped leaf, compressed, pointed, and inserted within the bosom of the petal. Ten connivent leaflets, inclosing the germ, form the nectary of *Zygophyllum* (530); each leaflet being fixed to the base of each filament. *Dalechampia* (1081) has a broad nectary, composed of many ovate, flat plates, in several rows.

I have mentioned before that, in tubulous corols, the nectareous juice is secreted into the tube: in many genera there is a horn or spur at the back of the flower, which answers this purpose of a recipient. Several plants have occurred in the course of our examinations,

examinations with a nectary of this form; as *Tropæolum* (466) *Larkspur* (681) *Aconite* (682) *Columbine* (684) *Antirrhinum* (750) *Fumitory* (849) *Violet* (1007) *Impatiens* (1008) and *Orchis* (1009): to these we may add *Pinguicula* (30) or *Butterwort*, *Utricularia* (31) and *Valerian* (44). In some species of *Antirrhinum* the horn is blunted, and becomes rather a bag; which is also its shape in the *Satyrium* genus (1010). The genera of this tribe are remarkable for their nectaries; in *Ophrys* (1011) it hangs down from the corol, longer than the petals, and is keeled at the back part; in *Serapias* (1012) it is of the same length with the petals, ovate, gibbous below, and with an ovate lip; in *Limodorum* (1013) it is of the same length with the petals, of one leaf, concave, standing on a pedicle, and within the lowest petal; in *Arethusa* (1014) it is of one leaf, tubulous, at the bottom of the ringent corol, and connate with it; in *Cypripedium* (1015) or *Ladies-Slipper*, as you have seen before^p, it is very large and inflated; and in *Epidendrum* (1016) it is tubulous at the base, turbinate or top-shaped, with an oblique, bifid mouth. Thus you observe that all the genera of this tribe have singular nectaries; whereas in the three classes with

^p Letter XXVII.

conjoined

conjoined filaments scarcely any are to be found⁹. The numerous genus of *Carex* (1046) or *Sedge* has an inflated, persistent nectary, contracting above, and toothed at top, where it gapes, but continues to invest the seed; in *Ruscus* (1139) also it is inflated and open at top, it is ovate, erect, and of the same size with the calyx.

In many genera the nectary takes the form of some well-known utensil or other thing. Thus in *Staphylæa* (374) *Tinus* (504) *Winterana* (598) and *Urtica* (1054) or Nettle, it is *Urceolate* or *Pitcher-shaped*. In *Narcissus* (403) and *Pancratium* (404) it is *Funnel-shaped*. In *Epimedium* (148) it is *Cyathiform* or *Goblet-shaped*. In *Byttneria* (268) *Theobroma* (900) or *Chocolate*, *Ayenia* (1020) and *Kleinbovia* (1024) it is *Bell-shaped*. In *Cissampelos* (1138) it is *Wheel-shaped*: and in *Epidendrum* (1016) *Poplar* (1123) and *Gleditsia* (1159) it is *turbinate*, or shaped like a boy's top, narrow at bottom, and spreading out above. The most beautiful of these nectaries is the *Crown-shaped*: in *Diosma* this is placed on the germ; in *Olax* (45) *Hamamelis* (169) *Nerium* (297) or *Oleander*, *Periploca* (303) *Silene* (567) and *Cherleria* (570) it terminates the tube of the corol: but in the *Passion-flower* (1021) it is a triple crown or glory, the outer one longest, surrounding the style.

⁹ In *Monadelphia* and *Polyadelphia* only one in each; and in *Diadelphia* three.

In *Garidella* (571) *Nigella* (685) and *Hel-lebore* (702) the nectaries are bilabiate; the first has five, the second has eight, and the third has an uncertain number. *Trollius* (700) has nine linear, flat, bent bodies, perforated at the base, on the inside; and *Isopyrum* (701) has five equal, tubulous, short nectaries, with a trilobate mouth, inserted into the receptacle, within the petals.

In *Arum* (1028) the nectaries resemble the filaments of stamens, only that they thicken at bottom; they come out in two rows from the middle of the spadix. In *Peganum* (610) the filaments themselves are dilated into nectaries at the base. In *Fevillea* (1118) they consist of five compressed, bent threads, placed alternately with the stamens. In *Trichilia* (528) the nectary is cylindric, and tubulous, formed out of the ten filaments, shorter than the petals, and with a five-toothed mouth.

You have observed that many nectaries already mentioned have an intimate connexion with the germ; it is a situation so common with this part of the flower, that some persons have suspected the sole or principal use of it to be to supply and foster the germ. Accordingly there are several other genera, in which it is thus placed. In *Mirabilis* (242) or *Marvel of Peru* it is globose, permanent, and

and incloses the germ; in *Cissus* (147), *Celosia* (289), *Limeum* (463), and *Phyllanthus* (1050), it is a ring surrounding the germ: in *Cynanchum* (304), it is cylindric, with a five-toothed mouth; in *Apocynum* (305), *Afclepias* (306), and *Stapelia* (307), it is made up of five bodies, which in the second and third entirely conceal the stamens and pistils, and in the third forms a double star: all of them about the germ. In *Gualtheria* (551) it is made up of ten short, awl-shaped, erect bodies, surrounding the germ, between the stamens.

It must not be dissembled however, that whatever use these bodies may be of to the germ, when they adhere to it, or are near it; they are frequently found on other parts of the fructification. Many instances of this have already occurred, and to these we may add, that they are found on the petals in *Bromelia* (395), growing to each of the three, above the base; in *Berberis* (442), or the *Barberry*, in two roundish orange-coloured bodies at the base of each; in *Hermannia* (828), each petal having a little membrane, forming altogether a cowled tube; in *Hydrophyllum* (204) and *Reaumuria* (686), in *laminæ* or plates growing to them; in *Myosurus* (394), being five awl-shaped bodies. The nectary is found on the calyx in *Tropæolum* mentioned before, in *Monotropa* (536), in some species of *Biscutella* (808), and in *Malpighia*,

Malpighia, mentioned also before among those which have glandular nectaries. This part is a globose gland on the exterior tip of the anthers in the *Adenantha* (526), at the base of them in *Ambrosinia* (1238): and on the filaments in form of glands in *Dictamnus* (522), in form of scales in *Zygophyllum* (530), placed horizontally on the real filaments in *Commelina* (62); and in *Plumbago*, *Campanula* and *Roella*, mentioned before. And, lastly, the nectaries are not unfrequently placed on the receptacle; as in *Lathræa* (743), *Clusia* (1140), *Melianthus* (795), and some others: but these are so close to the germ, which takes its rise from the same base, that they may very well be supposed to be placed there for its use.

But what shall we say, when we find the nectary, in the incomplete stamiferous flowers, which have no germ; as in *Willow* (1098), *Astronium* (1111), *Iresine* (1113), *Fevillea* (1118), *Poplar* (1123), *Rhodiola* (1124), *Kiggelaria* (1128), *Cissampelos* (1138), *Ruscus* (1139), *Clusia* (1140), and *Ophioxylon* (1142). In all these cases it certainly cannot be of any immediate use to the germ, which is not only on a distinct flower but on a different plant: this however being the most important part of the vegetable, since it is destined by nature to produce a new one of the same kind; and all the other parts

parts of the flower being in some measure subservient to this, whatsoever is immediately useful to these may fairly be said to be immediately serviceable to the germ.

But let us return to our history of facts, and finish this dry discussion, which I should not have troubled you with; if I could have directed you to any author, where you might find the different forms and situations of the nectary registered in one view.

Hitherto you have observed that this beautiful part of the flower is generally single, though in many cases formed of several portions: in some genera however it is double. Thus in *Krameria* (161), there are two nectaries, one above another; in *Stapelia*, as you have already seen, a double star, both flat and quinquefid, the lower with linear divisions torn at the end, surrounding the stamens and germs, the upper with acute, entire divisions covering them: something of the same kind is observable also in *Asclepias*, the very singular structure of whose flowers is particularly deserving of your attention. *Paullinia* (497) also, and *Sapindus* (499) have two nectaries, very different from each other; the one consisting of four petals inserted into the tails of the real petals, the other of four glands at their bases. I may here observe, that though the general use of the nectary, as the name implies, be to pour out the nectareous juice; yet it does not seem that all the bodies
to

to which Linnæus has given the name, serve that purpose: such may probably be the case in one of these nectaries of the genera before us, and perhaps of others, where this part is double. Lastly, *Clusia* (1140) has two sets of nectaries, one within the other; the outer of five three-parted, oblong bodies, placed in a ring within the petals, and of the same length with their tails; the inner of five little glands, which are certainly melliferous at top: it is observable that in the pistilliferous flowers of this genus there are no glands or inner nectaries, and the outer ones are of the same size, and in the same situation, but differ in form, being roundish and didymous, or twinned.

Concerning the form and variations in the other parts of the fructification, which furnish the generic character of vegetables, enough is to be found in the elementary books^r: of the leaves also, together with those other parts and circumstances, furnishing characters for the differences of about ten thousand one hundred species, which is the whole number of plants at present known, there is no want of instruction in the same authors, translated from Linnæus's original work. I shall only remark to you therefore, that a more minute attention and

^r Lee's Introduction; Rose's Elements of Botany, &c.

accurate observation of vegetables, discovered to Linnæus parts that former botanists had passed by unnoticed; and that his superior sagacity and genius enabled him to make a much more extensive use of such as were already known. The parts I now allude to, are what he calls *Fulcra*, props or supports of the plant. Among these the *arms*, that is, thorns and prickles, claspers or tendrils, some sorts of *pubescence*, and perhaps *glands*, in some few species had been noticed; but in a manner very loose and imperfect: but the *stipule*, which is a scale at the base of the petioles; and the *bracte*, which is a scale or small leaf next the flower, had not been so much as named; nor had any one thought of using these seven important though minute parts for distinguishing the species, a business to which they are so well adapted, both by their constancy and abundant variety.

He has also taken in other circumstances very happily, besides the mere *form*, to furnish specific differences, and for other purposes; such as the mode and degree of *ramification* in leaves and branches, the *intorfion*, or manner of turning or bending in the stems; the *gemination*, or various construction of the buds; the *foliation*, or different folding of the leaves before they are expanded; the *inflorescence*, or manner in which flowers are connected to the plant by their peduncles: all these, together with some others

others, which I have passed over, will occasionally furnish you with marks to distinguish plants from each other, even more certain in some cases than the form itself, and therefore highly worthy of your attention; but I have already trespassed on that too long, and will leave you to your leisure and more important concerns.

L E T T E R XXXII.

October the 4th, 1777.

I Have at length found time, dear cousin, to send you my last letter on the subject of Botany. I have not hastened it, because you have found full employment during the summer, either in examining such plants as had escaped you before, or in searching for their nectaries and other more minute parts. You have also by this time discovered, that the study or amusement which you have taken up, is not the affair of a single season.

As to the last and lowest class of vegetables — *Cryptogamia*, I shall at present touch it very slightly, because, though full of beauties, when examined with that attention which such small bodies require, it is much too difficult for our young cousin, and will probably be uninteresting even to you, unless you have already imbibed a greater passion for Botany than I wish you to have. The objects also of this class must be searched for in places, and at a season, by no means agreeable to your delicacy; and I will not have you risk your health, the most precious gift of heaven, even in pursuit of the most delightful knowledge. Gentle exercise, such as a proper attention to the study of nature, will induce you to take, accompanied with
that

that cheerfulness, regularity, and temperance, for which you are so conspicuous, is your best security for a continuance of this blessing: and that you may enjoy it uninterrupted to a period yet distant, my good wishes shall not be wanting.

You are already acquainted with the meaning of the name *Cryptogamia*, and the character of the class: you are also mistress of the four orders into which it is divided, together with their characters, such as they are. I have only therefore to present you with a few of the most obvious species in each order, wherein the generic and specific characters are the least inconspicuous.

The number of genera in this class are fifty-one, of species eight hundred and fifty eight.

The plants of the first order — the *Ferns*, are as large, and oftentimes as specious as those of the foregoing classes: it is apparent also to the naked eye, that there is a fructification, though the parts of it are not distinguishable. The general face of this, as it appears to the microscope, has been already described^u.

In general the fructification in this order of Ferns is on the backs of the leaves; that

* See page 101.

† See page 109, &c.

• Letter X.

however is not universal. For instance, in the genus *Equisetum*, or *Horsetail*, it is in a spike, each separate fructification being pel-tate, and gaping at its many-valved base: Hedwig has determined the flowers of the Horsetails and Adder's-tongue to be herma-phrodite. *Corn Horsetail*^v has these spikes on a naked stem, and other leafy barren stems come up later in the season. *Wood Horsetail*^w has the leaves compound, or divided, and the spikes at the end of the same stems. A species common in ditches^x has scarcely any leaves, and is perfectly smooth; in which circum-stance alone it differs from the *Shave-grass*^y used in polishing, which is rough.

Ophioglossum also, or *Adder's-tongue*, has the fructifications on a spike, in a jointed row along each side of it; when they are ripe, these joints gape transversely. Our common species^z, which is found in moist meadows, may be known by the *frond* or leaf being ovate.

Osmunda likewise has a spike distinct from the *frond*; it is branching, and each com-ponent fructification is globular. *Moonwort*^a,

^v *Equisetum arvense* *Lin.* Curtis, Lond. IV. 64. Ger. 1114.

^w *Equisetum sylvaticum* *Lin.* Ger. 1114. Hedw. theor. f. 1. 7.

^x *Equisetum limosum* *Lin.* Ray syn. t. 5. f. 2.

^y *Equisetum hyemale* *Lin.* Ger. 1113.

^z *Ophioglossum vulgatum* *Lin.* Fl. dan. 147. Mor. hist. f. 14. t. 5. f. 1. Ger. 404. Hedw. theor. f. 20—23.

^a *Osmunda Lunaria* *Lin.* Fl. dan. t. 18. Mor. hist. f. 14. t. 5. f. 1 Ger. 405.

which

which grows on dry pastures, has one naked stem, and one pinnate frond, forming the whole of this little Fern. *Flowering Fern*, or *Osmund Royal*^b, a large species found on bogs, has bipinnate fronds, bearing the fructifications in a raceme at top. *Rough Spleenwort*^c has lanceolate, pinnatifid fronds, with the divisions confluent, quite entire and parallel: these are of two sorts; the narrower being covered with fructifications on their backs, and the broader being barren. This therefore recedes from the character of the genus, in having a fertile frond instead of a spike, distinct from the barren one.

The remaining genera have the fructifications invariably on the back of the fronds. In *Acrostichum* they cover the whole disk. In *Pteris* they are to be found only round the edge: the *common Fern* or *Brake*^d, which is so abundant in uncultivated grounds and woods, has supradecompounded, or triply-pinnate fronds, the leaflets pinnate, the lobes lance-shaped; the lowest pinnatifid, and the upper ones less.

Asplenium has the fructifications in lines, that are frequently parallel. *Hart's-tongue*^e

^b *Osmunda regalis* Lin. Fl. dan. t. 217. Ger. 1131.

^c *Osmunda Spicant* Lin. Curtis, Lond. II. 67. Ger. 1140. Hedwig theor. f. 24—29.

^d *Pteris aquilina* Lin. Blackw. t. 325. Ger. 1128.

^e *Asplenium Scolopendrium* Lin. Curtis, Lond. I. 67. Ger. 1138.

has simple fronds, heart-tongued, that is drawn out into length, and hollowed next the petiole; quite entire, and the petioles shaggy: this grows on rocks and in shady places. There are several smaller species with pinnate or decomposed leaves, not uncommon on walls and rocks.

In *Polypody* the fructifications are in distinct roundish dots, placed in rows, and increasing so much in size, as they advance to maturity, that they occupy the whole of the disk in some species, and great part of it in others. *Common Polypody*^f has pinnatifid fronds, the *pinnae* or lobes oblong, a little toothed and obtuse; the root is scaly: this is common on trees, walls, and rocks. Many species that are generally called Ferns, from the disposition of the fructifications, are of this genus: of these, that which is most common, has vulgarly the name of *Male Fern*^g, and is found in woods, heaths, and on rocks, not covering the ground like the Brake, but in detached parcels: the fronds of this are doubly pinnate, the *pinnae* or lobes obtuse, and crenulate, or slightly notched, and the stem chaffy.

Lastly, *Adiantum* has the fructifications in terminal spots, under the margin of the frond,

^f *Polypodium vulgare* *Lin.* Curtis, Lond. I. 68. Ger. 1132.

^g *Polypodium Filix mas* *Lin.* Blackw. t. 323. Vaill. t. 9. f. 2. Mor. hist. f. 14. t. 3. f. 6. Ger. 1128.

which

which is folded back. *True Maiden-hair*^b, which is used, or supposed to be so, in the syrup of capillaire, is of this genus, and has decomposed fronds, the component leaves alternate, and the lobes wedge-shaped, lobate, and pedicelled. It grows, but rarely, on rocks and walls.

The plants of the second order—the *Mosses*, have leaves like the more perfect vegetables, distinct from the stalk; and in this they differ from the Ferns, in which the stalk and leaf always, and the fructification often, are blended, to form the *frond*. They are perennial, and when ever so much dried up, will revive again with moisture; as Haller experienced in some specimens of Caspar Bauhin's *Hortus Siccus*, which must have lain in a dry state above a century. You know them by their air, or habit, as botanists usually call it. A general idea of their fructification has been already givenⁱ, as far as it is visible to the naked eye; and we can only hope for a perfect account of it from a laborious examination with glasses of considerable magnifying powers^k.

^b *Adiantum Capillus Veneris* Lin. Jacq. misc 2. t. 7: Ger. 1143.

ⁱ See letter X.

^k This has now been done by *Hedwig* in his *Fundamentum Historiæ Naturalis Muscorum Frondosorum*. Lipsiæ 1782, quarto; and, *Theoria generationis et fructificationis Plantarum Cryptogamicarum*, Petrop. 1784, quarto; both with coloured plates of the parts of fructification much magnified.

The generic characters of the Mosses are taken from the heads, which are either sessile, or else the plant pushes them up on a slender, naked stem; this Linnæus calls the *Anther*, but I shall beg leave rather to name it the *Capsule*¹: in four genera^m it is naked, or not covered with a *calyptré* or *veil*; in the other seven it is.

Lycopodium or *Wolf's-claw Moss*, has a two-valved, sessile capsule, without any calyptré. *Sphagnum*, or *Bog-moss*, has the capsule covered with a lid, and a smooth mouth. The grayⁿ species is common on bogs, covering vast tracts of them; and is known not only by its hoary appearance, but by its deflected branches.

Polytrichum has a capsule covered with a lid, sitting on a small protuberant eminence, which is a kind of receptacle, and is called by Linnæus *Apophysis*, by Haller the *Disk*; the capsule is covered by a villous calyptré. There is a star or rose on a distinct individual, which has been generally taken for the pistilliferous flower; Haller rather thinks it is only a kind of bud, from which new branches spring. The common species, called *Greater Golden Maidenhair*^o, is known by its

¹ As Linnæus thinks it really is. See *Genera*, p. 556, and Hedwig has shown it to be.

^m *Lycopodium*, *Porella*, *Sphagnum* & *Phascum*.

ⁿ *Sphagnum palustre* *Lin.* Fl. dan. 474. Dillen. t. 32. f. 1.

^o *Polytrichum commune* *Lin.* Dillen. t. 54. f. 1. Ger. 1559.

simple

simple stem, and the parallelopiped form of the capsule. This is a large sort of Moss, and abundant in woods, heaths, and bogs.

The three remaining genera of Mosses, which are also the principal and most numerous, are thus distinguished. *Mnium* agrees with *Polytrichum* in having two sorts of fructification; the one a lidded capsule, covered with a smooth calyptré: the other a star or rose, in the disk of which are some globose little dusty bodies. *Bryum* and *Hypnum* have none of these stars or roses: these have both a lidded capsule, covered with a smooth calyptré, and are distinguished from each other, by the stalk which supports the capsule being naked, and arising from a terminal tubercle in the first; whereas in the second it springs from the side of the branch, and is surrounded at bottom by a *perichæ-tium*, scaly sheath, or receptacle.

One species of *Mnium*, whose filaments or capsular stalks are so sensible of moisture, that it has obtained the name of *hygrometric*^p, has no stems, nodding turbinate or pear-shaped capsules, reflected four-cornered calyptrés, and ovate leaves forming a head; they are of a yellowish green, and the filaments are an inch and half high, and red or orange-coloured.

^p *Mnium hygrometricum* *Lin.* Fl. dan. 648. f. 2. Dillen. t. 52. f. 75. Mor. hist. f. 15. t. 7. f. 17.

One of the most common species of *Bryum* is the *hairy*^a, which covers the old thatch of cottages; this has the capsules rather erect, and the leaves ending in a hair, and recurved. *Apple-form Bryum*^r has large spherical heads; and in the *Pear-form* species^s they are obovate, covered with an awl-shaped calyptré; the shoots are stemless, and the leaves are ovate and awnless. *Brown Bryum*^t has erect roundish capsules, with a pointed lid. This is a very small Moss, growing close to the ground in thick tufts; the filaments are three or four lines high, and when the capsules have lost their lid, they have a truncated appearance, whence their name.

Silky Hypnum^u, one of the most beautiful, and not the least common of the genus, is known by its creeping shoots, its crowded erect branches, its awl-shaped leaves, and erect capsules. This grows both in dry places, such as on walls, or trees; and in wet ones, as meadows: in the first the leaves are narrow, and pressed close to the stalk, in the second they are broader, spreading, and shining, like silk: the capsules are long, round, enlarging a

^a *Bryum rurale* *Lin.* Dill. t. 45. f. 12. Mor. t. 6. f. 1.

^r *Bryum pomiforme* *Lin.* Dill. t. 44. f. 1. Mor. t. 6. f. 6.

^s *Bryum pyriforme* *Lin.* Dill. t. 44. f. 6. Mor. t. 7. f. 16.

^t *Bryum truncatulum* *Lin.* Curtis, Lond. II. 70. f. 2.

^u *Hypnum sericeum* *Lin.* Curtis, Lond. II. 69. Dillen. t. 42. f. 59. Mor. t. 5. f. 25.

little at bottom, with a slender ciliated mouth, a scarlet beaked lid, and a pale calyptré; they are supported by a purple stalk, or filament, from half an inch to an inch in height, surrounded at the base by a short thick scaly *perichætium*. This may serve as a specimen of the numerous species of *Hypnum*; and we will now pass on to the third order of the *Cryptogamia* class, containing the

Algæ or *Flags*, which are chiefly the *Lichens* or *Liverworts*, *Sea-weeds*, and some few commonly called Mosses, but having in reality the character of this order^v. Of these last, *Common Marchantia*^w may serve as an instance: it grows by streams and fountains, in wet shady places, and on walls subject to a drip. There are two distinct fructifications in this genus, one standing out from the plant on a peduncle, and consisting of a peltated calyx or receptacle, covered with small one-petalled corols underneath, each of which has one multifid anther or capsule; the other sessile, shaped like a cup or bell, and containing many little roundish bodies, which some take for seeds. The species here pointed out is distinguished by the common calyx being ten-cleft: it varies much in its appearance, and hence has its trivial name of many-form. This

^v See letter X.

^w *Marchantia polymorpha* Lin. Dillen. t. 76. f. 6., Hedw. theor. f. 123—133.

genus is evidently the connecting link between the Mosses, and the *Lichens*, which we shall now examine.

This genus has a roundish, flattish, shining receptacle, or common calyx, seldom elevated; and a meal sprinkled over the leaves. The receptacle affording a variety of forms, has suggested a subdivision of this otherwise unweildy genus, the leaf and manner of growth taking their parts in it. *Lichens* abundantly clothe the earth, rocks, and vegetables, especially trees; in the form of meal, crust, leaf, or thread: age, soil, and situation, make so great a difference in their appearance, that numberless varieties have been advanced into species. The sections of the genus are, 1. The *Tuberculate*, consisting of a crust adhering closely to the bark of trees, or stones, above which roundish tubercles rise a little; these are rather irregular, a little flattened at top, and without any rim round them. Sometimes they run into regular figures, and resemble writing^x, or a map^y. 2. *Scutellate*, or such as have little shields, or roundish receptacles with a rim, and the disk somewhat depressed, arising from a granulous crust more approaching to a leafy structure than in the former section, and not adhering so strongly. 3. *Imbricate*,

^x *Lichen scriptus* *Lin.* Dillen. t. 18. f. 1.

^y *Lichen geographicus* *Lin.* Dillen. t. 18. f. 5.

composed

composed of many small leaves, generally in an orbicular form, laying over each other, the least in the middle, and the largest on the outside; from some of these arise little shields, and others have little mealy tubercles at the ends of the leaves. Nothing is more common than a yellow species² of this section, on trees, walls, and rocks; the leaflets of it are curled, deep yellow above, and ash-coloured underneath; the shields are of a lighter yellow, grow brown with age, and are thick set towards the middle of the plant; other specimens, instead of shields, have a yellow meal spread over them: the leaves by age become greenish, and then of a brownish ash-colour, warted and leprous.

4. *Leafy*, properly so called, consisting of one continued leafy substance, variously laciniate, cut or torn; these have generally large, wide shields, often on peduncles, either in the divisions of the leaves, or on their edges.

Lungwort or *Tree Lichen*^a, which hangs from old oaks, and beeches in woods, has very large jagged leaves, smooth, and ending obtusely, the upper surface is wrinkled and pitted, the lower downy: the shields are of the size of a lentil, and placed on the edges of the leaves. 5. *Coriaceous* or *Leathery*:

² *Lichen parietinus* *Lin.* Dillen. t. 24. f. 76. Wall Liverwort.

^a *Lichen pulmonarius* *Lin.* Dillen. t. 29. f. 113. Ger. 1566.

these

these are also leafy, but differ from those of the fourth section in consisting of several leaves, of a tougher texture, broader, less sharply laciniate, not branching, and generally adhering closer to the bodies on which they grow: the receptacles are very large, and from their resemblance to the round shields of the ancients, called *peltæ*; they are generally on the edges of the leaves, and little or not at all notched on the edges. *Ash-coloured Ground Liverwort*^b is of this section: it is creeping, lobate, obtuse, and flat; veined underneath, and villous, with a rising *pelta* or target on the edge: this species is very common on the ground in woods, and on heaths, particularly on old ant-hills: the leaves are ash-coloured, and white underneath. 6. *Umbilicate* or hollowed like the navel, and footy, or appearing black, or as if burnt. 7. *Cup-bearing*, consisting of a granulous crust, in process of time unfolding into little leaves irregularly laciniate: from these arise a stipe or stem supporting hollow conical receptacles resembling little tea-cups or glasses, whose edge is often set with brown or scarlet tubercles. The different appearances of *Cup-moss* are probably but varieties arising from the different age of the

^b *Lichen caninus* Lin. Fl. dan. 767. f. 2. Dillen. t. 27. f. 102. Mor. f. 15. t. 7. f. 1. This is the species recommended against the bite of mad dogs, mixed with white pepper.

plant. 8. *Shrubby*, or resembling shrubs or coral: these consist of a leafy crust like the last, but they have no cups, only tubercles, and they are branched. The famous *Rhen-deer Moss*^d is of this section: it is perforate^c, very much branched, and the small branches are nodding: it grows on heaths and mountainous pastures with us. 9. *Tready*, or consisting of mere round, solid, stiff stalks or threads, frequently covered or incrustated with a meal, which is very inflammable, and terminating in dry globules, a little hollowed, and without any rim. These most of them hang from the boughs of trees, and hence have the name of *Tree-moss*. But this very numerous and widely diffused genus has already detained us too long.

The *Sea-weeds* are comprehended in three genera—*Ulva* or *Laver*, *Fucus* and *Conferua*. In the first the fructifications are in a diaphanous membrane, and the substance of the plant is membranaceous, at first bladdery, but afterwards leafy. *Fucus*, *Wrack*, or *Sea-weed* properly so called, has two kinds of bladders, the one smooth, hollow, and interwoven with hairs, the other smooth, filled with a jelly, in which are immersed small perforated grains, in each of which is sup-

^c *Lichen rangiferinus* *Lin.* Fl. dan. 180. Dillen. t. 16. f. 29.

^d That is, there are little holes in the alæ of the branches, as if made with a pin.

posed to be a seed: the texture of these plants is *coriaceous* or leathery. *Conserveæ* are composed of unequal tubercles, in very long capillary fibres, which are either continued or jointed. The two last genera will furnish you with abundant amusement, whenever you are led to spend a little time on the sea-coast; but the species are so numerous, that the examination of the specific differences would carry me into too wide a field: we will pass on therefore to the last order of this last class of vegetable nature—the *Fungi* or *Mushrooms*, which are universally known by their singular structure and appearance; without branches, leaves, flowers, or any thing we can certainly call fructification, and scarcely any root. The *Agaric*, one of the principal genera in this order, is known by its horizontal manner of growing, and by having *lamellæ* or gills underneath. The *Champignon*^e, or common eatable Mushroom, is one of these, and has the following characters—the head is convex, scaly, white; and supported on a stipe or stalk; the gills are red; that which has white gills is only a variety of this, and though far inferior in quality, is not poisonous. The *Chanterelle*^f, or little yellow Mushroom, so common in the fairy rings on dry pastures, is also stipitate,

^e *Agaricus campestris* *Lin.* Mill. illustr. Fl. dan. t. 714.

^f *Agaricus Chantarellus* *Lin.* Fl. dan. 264. Ger. 1580.

with the gills branched and decurrent. What is commonly called *Agaric* in medicine, and is used in stopping of blood, is of another genus.

Boletus, which grows horizontally like the last, but instead of gills, has pores on the under surface.

Morel^g is a fungus that is reticulate or netted all over the outside or upper surface, and smooth beneath. The esculent species has the head egg-shaped and cellular, the stipe or stem naked and wrinkled.

Truffle or *esculent Puff-ball*^h, is a roundish fungus, filled with a mealy substance, taken for seed: this species is globular, solid, mucicated, or rough on the outside, without any root, and growing wholly under ground: the other sorts are full of dust, which they throw out when ripe, and are wholly above ground except their roots. *Common Puff-ball*ⁱ is roundish, and discharges its dust by a torn aperture in the top; this varies much in form, and also in size, from a little ball to that of a man's head.

After all, the objects of this order are not universally allowed to be plants, but are suspected, though seemingly without much reason, to be formed by animals, for their habitation, after the manner of Zoophytes

^g *Phallus esculentus* *Lin.* Fl. dan. 53. Ger. 1583.

^h *Lycoperdon Tuber* *Lin.* Michel. t. 102. Ger. 1583.

ⁱ *Lycoperdon Bovista* *Lin.* Schœf. t. 190. Ger. 1582.

or Corals. But this is a subject too difficult and nice for our discussion : and perhaps, after all, the *fungi* may prove to be one of those links in the chain of nature, which unite the vegetable to the animal kingdom ; and though they should turn out to be the habitation of minute insects, and to be formed for and by them, yet they may at the same time have the growth and texture of plants. Nature is full of these wonders, dear cousin ; we are admitted to the view of a very small portion of it only ; there is little hope then that we should be able to understand its relations fully, or to unravel all its mysteries.

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